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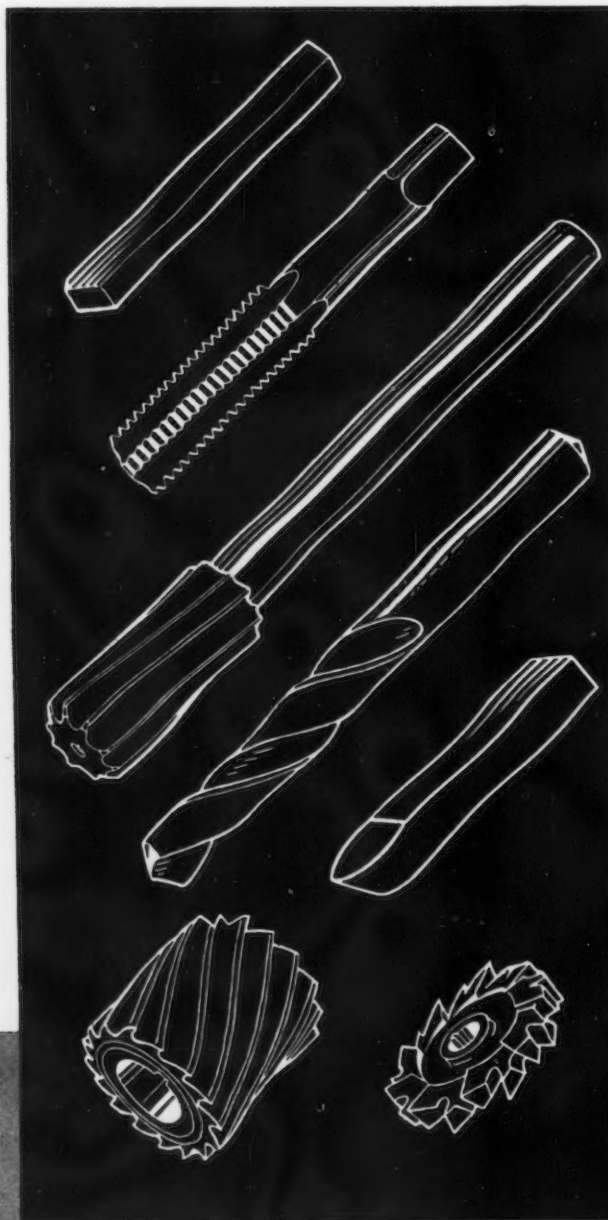
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# ▲▲▲ THE IRON AGE ▲▲▲

APRIL 6, 1939

ESTABLISHED 1855

Vol. 143, No. 14

## LITTLE BUSINESS AND THE WAGNER ACT

NOT long ago a judge issued an injunction against picketing in the case of a small business concern. There were only a few people employed by this concern, but these few had joined one of the big unions and were therefore entitled to "service" for their dues money. However, the judge, who made it plain that he had nothing against unionism as such, held that a concern of this small size was so weak in comparison with the strength of the union that it had no chance whatever in the case of a controversy.

Now that was something that few people had considered. We look upon legitimate unionism as evening the odds for the small fry. Making it possible, when it is necessary, for little Bill Jones, who is just a cog in a big corporation, to "stand up for his rights" before the president, board of directors, corporation lawyers and other brass hats.

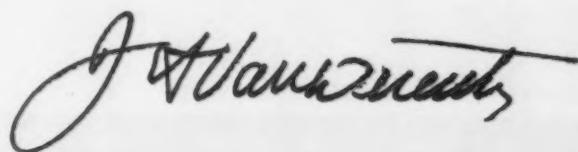
That, at least, is the theory. It is the American theory of fair play. None of us likes to see a big fellow take advantage of a little one. It was that theory that enabled the passing of the Wagner Act.

But we did not consider the other side of it. We did not think of the small employer who, with his limited resources, is far more helpless when put upon by the CIO or the Labor Board than Bill Jones against his big employer.

Just to see how many of these little employers there are who face such embarrassing predicaments, we referred to the Labor Information Bulletin, published by the United States Department of Labor. (Issue of January, 1939, page 5.) Much to our surprise we learned from this that of all the employers of labor in our country, exclusive of railroads, farmers and non-profit public services, three-quarters of them average nine or fewer workers each.

Every one of these 1,297,500 little business men who employ nine people or less would find himself in an extremely unpleasant and vulnerable position if, perchance, he incurred the wrath of bushy browed John, or if he were brought before a Labor Board Court, backed by Uncle Sam's billions. With his few dollars in the bank, he could not even afford to hire a good lawyer.

After all is said and done, the Wagner Act seems to resemble the old-fashioned coal burning fire engine that did not have a spark arrester. When it went to put out a fire, it usually started ten other fires along the way before getting there.





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# WHAT ABOUT

# Grain Size?

By Carl L. Shapiro

Consulting Engineer, New York

° ° °

**T**HIS is the third section of a three-part article, and deals with the effect of the austenitic grain size upon the mechanical and physical properties of steel. Part I, describing the various methods by which the austenitic grain size is determined, appeared in the March 16, 1939, issue of *THE IRON AGE*, and Part II, describing the factors which influence the austenitic grain size, appeared in the March 30, 1939, issue.

° ° °

per cent nickel steels, they did not find any marked difference in carbon penetration between the fine and coarse grained steels.

To further investigate the effect of grain size upon case depth and characteristics, the writer carburized a series of coarse and fine grained (prior structure) nickel (SAE 2512), chrome-nickel (SAE 3312) and one per cent basic electric carbon tool steels. After carburizing (McQuaid-Ehn Test), the specimens (8 in. long x 1 in. in diameter) were tested for the percentage of carbon present by removing successive outside layers (0.003 in. radius) and testing for carbon by the combustion method. The results of the carbon determinations showed that the cases of the coarse grained nickel and chrome-nickel steels were always slightly higher in carbon concentration than the cases of the fine grained steels. However, in the 1 per cent carbon steels, no

difference in carbon content between the fine and coarse grained steels was observed.

To note whether the carbon content of the original uncarburized material influenced the case depth of fine and coarse grained steels, series of fine and coarse grained low, medium and high carbon steels, containing 0.10, 0.50 and 1 per cent carbon respectively, were carburized 8 hr. at 1700 deg. F. and furnace cooled. The carbon content of the carburized steels showed that (a) the case of the coarse grained low carbon steel (0.10 per cent carbon) possessed a very much greater carbon concentration than the fine grained low carbon steel, (b) the coarse grained medium carbon steel (0.50 per cent carbon) was slightly greater in carbon concentration than the fine grained steel, and (c) the carbon concentration of the high carbon steel (1.0 per cent carbon) was practically the same.

Since the original carbon content of the material seemed to influence the carbon penetration of fine and coarse grained steels during carburization, another series of the foregoing steels were carburized 16 hr. at 1700 deg. F. instead of 8 hr., to note whether time at temperature affected the trend of the above results. The findings of this portion of the investigation not only confirmed the above results in the low and medium carbon steels but intensified them. Moreover, in the high carbon steel, they showed that the carbon penetration in the coarse grained steel became greater than in the fine grained steel.

Concluding the effect of grain size upon the case depth of carburized steels, it may be stated that (1) coarse grained steels will always carburize more deeply than fine grained steels

**S**INCE a knowledge of the austenitic grain size is absolutely of no value unless its effect upon the physical properties of steel is known and applied in service, the following paragraphs briefly summarize the influence of grain size variations upon the physical properties and characteristics of steels. These conclusions are based mainly upon published data and, although they show definite trends, they must be judiciously evaluated since they are controlled largely by the method of deoxidation. Consequently, what applies to a killed steel (fully deoxidized) does not hold for un-killed or rimming steel and vice versa.

*Effect of Grain Size on Case Depth and Characteristics:* McQuaid and Ehn<sup>12</sup> showed that (a) fine grained steels, carburizing steels, were more prone to yield soft spots on quenching than coarse grained steels, (b) fine grained material carburized less deeply than coarse grained, and (c) fine grained material had a greater tendency to warp than coarse grained steels due to its non-uniform hardening. Epstein, Nead and Washburn<sup>13</sup> also showed that the coarse grained steels carburized more deeply than fine grained steels (aluminum killed), and that the case depth was usually 10 to 20 per cent greater. Swinden and Bolsover<sup>14</sup> observed in low carbon steels that only a small difference existed between the carburized cases of fine and coarse grained steels, with the latter possessing a slightly higher carbon penetration than the former (fine grain steels). In carburized 3

<sup>12</sup> H. F. McQuaid and F. W. Ehn, Transactions, A. I. M. E., Vol. 67, 1922, p. 341.

<sup>13</sup> S. Epstein, J. H. Nead and T. S. Washburn, Transactions, A. S. M., Vol. XXII, 1934, p. 942.

<sup>14</sup> T. Swinden and G. R. Bolsover, Journal Iron and Steel Institute, 1936.



if given sufficient time at temperature, (2) the difference in carbon concentration, after carburization, between coarse and fine grained specimens of the same heat is determined mainly by the original carbon content of the material and time at temperature, and (3) this difference progressively decreases with the original carbon content of the material.

**The Function of Grain Size Upon the Rate of Transformation:** It has been known for many years that the structural condition of the material prior to heating above the thermal critical influenced the alpha-gamma transformation range and temperature. However, where sufficient time is given to complete solubility at each definite temperature interval, in ideal and equilibrium conditions, the variation in prior structure and grain size should not affect the characteristics and temperature range of the alpha-gamma transformation range and temperature.

In steels of similar composition, Davenport and Bain<sup>1</sup> showed that the normality of the steel influences the transformation characteristics. Fig. 10 reveals that abnormal fine grained steel possesses, during transformation, a higher carbon diffusivity and transformation range than normal coarse grained steel.

A summary of the entire situation is adequately given by Herty<sup>12</sup> who reviewed his work in low and medium carbon steels as follows:

"... the rate at which ferrite is formed during the transformation of gamma to alpha iron is proportional to the grain area per unit volume and to the specific reactivity of the steel. Fine grained steels obviously transform more rapidly than coarse grained steel on account of the larger grain surface involved. However, if both fine and coarse grained steels be overheated until they both have the same grain size, the steel which was originally fine grained will still have a higher transformation rate than the originally coarse grained steel. This higher transformation rate is presumably due to the presence of fine particles which act as nuclei for ferrite formation. In this particular instance the specific reactivity is not as great a factor in rate of transformation as is grain size, but the effect is nevertheless present and would undoubtedly cause some variations in

certain properties which depend on the extent to which the transformation occurs. This subject of rate of transformation and specific reactivity is of the utmost importance in all heat treatments. In hardened steels for example, the two factors, grain size and specific reactivity determine, for a given quenching procedure, the depth of hardening and properties of the hardened piece."

Since the subject of hardenability is the heading of the following topic and since it is mainly a function of transformation rates and grain size, these two factors will be considered

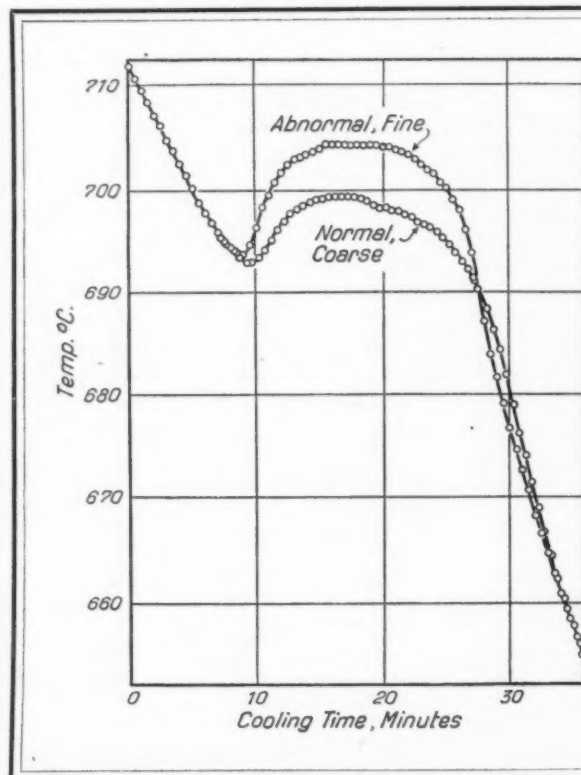
together in order to obtain a concise version of their inter-relationship.

mum hardness in order to avoid any confusion, as was pointed out by Grossmann.<sup>13</sup> To illustrate this fact, Grossmann cited the case of two steels: "... a 0.70 per cent carbon steel and a 0.35 per cent carbon steel, the former may when fully hardened attain a hardness of Rockwell C 65, compared with only Rockwell C 57 for the latter, but the two steels may have the same hardenability; that is, they may require the same speed of quenching to bring their respective full hardness."

To note the effect of grain size variation upon hardenability, Davenport and Bain<sup>1</sup> hardened and fractured a series of specimens from the same temperature after they were coarsened to various degrees. The results they obtained are shown in Fig. 11. These illustrations readily reveal the tremendous importance of the austenitic grain size upon the depth of hardness and penetration.

In many cases, such as in carbon and alloy structural steels, various investigators report that the depth of penetration between fine and coarse grained steels were approximately similar and that, in general, the fine grained material had a lower hardness than the coarse grained steel.

Many test methods and procedures have been advanced to determine hardenability but, to date, the only



**FIG. 10—Simultaneous cooling curves for fine-grained abnormal and coarse-grained normal steels of similar composition. (Davenport and Bain)**

port and Bain<sup>1</sup> hardened and fractured a series of specimens from the same temperature after they were coarsened to various degrees. The results they obtained are shown in Fig. 11. These illustrations readily reveal the tremendous importance of the austenitic grain size upon the depth of hardness and penetration.

**The Effect of Grain Size Upon Hardenability (Hardness and Penetration):** This subject has held the spotlight since 1930 when Bain and his co-workers introduced the S curve and the subject of hardenability. Its importance has not been exaggerated as many still believe but, in fact, underestimated from the practical and theoretical considerations. However, since the subject of "hardenability" is the focus of much investigation and publication, it suffices in this article only to discuss the effect of grain size upon hardness and depth of penetration. Before doing so, it is of prime importance to distinguish between hardenability and the potential maxi-

<sup>12</sup> C. H. Herty, Transactions, A. S. M., Vol. XXIII, 1935, p. 113.

<sup>13</sup> M. A. Grossmann, Metal Progress, 1938.

<sup>14</sup> M. A. White and C. H. Clark, Transactions, A. S. M., Vol. XXII, 1934, p. 1069.

reliable method used to ascertain the complete depth of hardness penetration and hardness is by means of the acid etch method, which reveals the depth of the case and core of the hardened specimens, and by hardness measurements (Rockwell, Vickers or scratch methods), which indicates the hardening power of the material.

Since many factors influence the hardenability rating of a steel and since this discussion refers only to the effect of grain size variations upon hardenability, the author recommends the reading of the 1938 publications of the American Society for Metals

White and Clark<sup>17</sup> performed short time tensile tests upon two molybdenum steels (0.50 Mo and 0.25 Mo plus 1.25 Mn) at room and at elevated temperatures up to 1400 deg. F. and concluded that (1) the grain size influences the tensile properties at room and elevated temperatures, (2) coarse grained steels possess a greater tensile strength than fine grained material over a major portion of the temperatures studied, (3) the yield stress (stress which produces a permanent deformation of 0.2 per cent of the gage length) of the coarse grain manganese-molybdenum steel is superior

reached, approximately 900 to 1000 deg. F., and then the coarse grained material is superior to the fine.

Swinden and Bolsover<sup>14</sup> also examined the effects of grain size upon the tensile properties of 18 open hearth steels and postulated that, in general, the yield point and ultimate strength decreases with the finer grain size, while the elongation and reduction of area increase with the smaller grains.

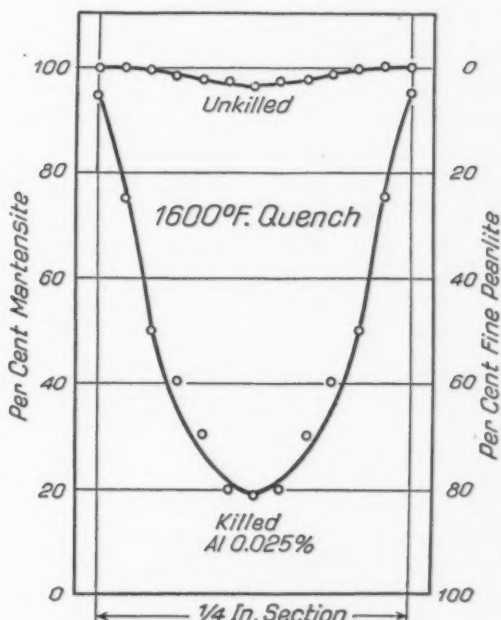
The above results seem to indicate that, at room temperature, the coarse grained material possesses less ductility than fine grained steels, but a greater strength; while at elevated temperatures, these characteristics may vary in the different types of steels.

**Effect of Grain Size Upon Creep:** In the outstanding 1939 Howe Memorial Lecture, Dr. H. W. Gillett revealed the true lack of knowledge that we possess concerning the characteristics of creep and the inference of grain size. As Dr. Gillett timely stressed, although much work has been done upon the various factors influencing creep, no definite conclusion can be drawn. It may be stated, however, as was shown by Dr. Gillett, that coarse grained steels, in regard to creep characteristics, are superior to fine grained steels, at elevated temperatures, and the resistance to creep becomes less with finer grain size.

**The Effect of Grain Size Upon Impact Properties:** Numerous investigations definitely showed that fine grained steels possess a much higher impact value than coarse grained steels of the same heat. This increase of impact value seems to vary with the different types of steels and with the deoxidation process but, nevertheless, regardless of the type of steel and deoxidation method employed, fine grained steels seem to possess a greater impact value than coarse grained steels.

**The Effect of Grain Size Upon Temper Brittleness:** After showing that a fine austenitic grain size yields a higher impact property than a coarser grain, Swinden and Bolsover<sup>14</sup> also investigated the effect of grain size variation upon the temper brittleness in steel. (Temper brittleness, as is well known, is the name applied to the loss of ductility or impact that results after tempering a hardened specimen to a sub-critical temperature and slowly cooling. This loss of impact is not observed in specimens quenched from the tempering temperature but only in those which are slowly cooled.) Swinden and Bolsover

**FIG. 11—Hardenability of the un-killed and aluminum-killed 0.39 per cent carbon steels of Fig. 10, as measured by the proportion of martensite and fine pearlite in  $\frac{1}{4}$ -in. disks quenched from 1600 deg. F. (Davenport and Bain)**



dealing with hardenability, as they present many new angles and information upon this pertinent subject which is not within the scope of this paper.

**Effect of Grain Size Upon Tensile Properties:** To determine the effect of grain size variation upon the tensile properties of steel, Epstein, Nead and Washburn<sup>18</sup> made tensile tests upon specimens taken from the middle and bottom of coarse and fine grained ingots. These results showed that after a heat treatment, which produced a difference in grain size between coarse and fine grained steels, the fine grained steels possess a greater yield strength, a slightly higher ductility and approximately the same tensile strength.

to the fine grained material over the greater portion of the temperature range (up to 1200 deg. F.) and then dips slightly below the fine grained steel; while in the carbon-molybdenum steel, the fine grained material is superior from 80 deg. to 900 deg. F. and above this temperature, the coarse grained steel possesses the higher value, (4) only a slight variation exists between the proportional limit of fine grained and coarse grained steels, and (5) the ductility (elongation and reduction of area) of these two types of steel show that, although no practical difference exists between the fine and coarse grained steel at room temperature, the fine grained steel is superior to the coarse grained material until a certain range is

**TABLE III**  
The Effect of Deoxidation on Aging of Carbon Steel

Steel No.	Increase in Hardness After Quenching, Rockwell B	Izod Impact—Foot Pounds		Per Cent (Ft.-Lb.) Loss During Agings
		Before Strain Aging	After Strain Aging	
1	9.9	54.2	6.2	88.2
2	7.2	72.5	14.4	80.1
3	4.6	77.5	22.9	70.9
4	1.2	85.3	75.3	11.8

**TABLE IV**  
The Effect of the Austenitic Grain Size Upon the Physical, Chemical and Structural Characteristics of Steels

Influence of Grain Size Variation Upon:	Remarks
Carburizing Characteristics	(1) Fine grained steels are prone to yield soft spots and abnormality. (2) Fine grained steel carburizes less deeply than coarse grained steels. (3) For constant carburizing time and temperature, the per cent carbon impregnated is less than coarse grained steels.
Rate of Transformation	Fine grained steels transform more rapidly and at a higher temperature than coarse grained steels.
Hardness	Hardness decreases with the increase of grain size in mild sheet steel.
Hardenability	Fine grained steels harden less fully than coarse grained steels.
Tensile Properties	No general consensus. Results are influenced by the method of deoxidation. However, it is generally upheld that fine grained steels possess better ductility than coarse grained steels but possess slightly lower strength characteristics.
Creep	Coarse grained steels are more resistant to creep than fine grained steels.
Impact	Fine grained steels seem to possess greater impact values than coarse grained steels.
Temper Brittleness (Impact)	Resistance to temper brittleness becomes greater with the finest grain size.
Brittleness at Sub-Zero Temperatures (Impact)	Impact values of fine grained steels are greater at sub-zero temperatures than coarse grained steels.
Magnetic Characteristics	Hysteresis, residual and coercive force decrease with increasing grain size.
Aging	Fine grained steels age less than coarse grained steels, depending primarily upon the type and method of deoxidation.
Machineability	In dispute. Generally believed, however, that coarse grained steels are more easily machined than fine grained material.
Recrystallization	Constant deformation and temperature: Fine grain requires a shorter time and temperature. Constant deformation and time: Fine grains recrystallizes at a lower temperature. Constant time and temperature: Fine grained steels recrystallize much faster than coarse grained steels for the same given amount of reduction.
Decarburization	Fine grained steels decarburize less than coarse grained steels.
Piping	Fine grained steels pipe more deeply than coarse grained steels.
Deep Stamping	Fine grained steels are superior to coarse grained steels since they result in a smoother finished surface condition.
Heat Treatment	Tempering: Fine grained steels respond to tempering much faster than coarse grained steels. Annealing: The finer the grain size, the shorter becomes the annealing time. Solubility: Fine grained material goes into solid solution much faster than coarse grained material. Agglomeration (aging): Fine grained material agglomerates (ages) more quickly than coarse grained material either at room temperature (normal aging) or at elevated temperatures (accelerated aging).
Chemical Test	Colorimetric Comparison Tests: Fine grained steels dissolve more rapidly than coarse grained steels and indicated a lower calculated percentage of element present, e.g., color carbon tests. Volumetric-titration Test: Fine grained steels yield a greater calculated percentage of element after titrating than coarse grained steels, e.g., nitrogen test.

noted after tempering hardened coarse and fine grained steels that the coarse grained material was less susceptible to temper brittleness than the fine grained material, although the impact resistance of the fine grained steel was greater than the coarser aggregate.

McQuaid,<sup>18</sup> who also determined the effect of tempering upon two medium carbon steels, showed that for identical hardness, the Izod values of the fine grained steels were approximately six times greater than that of the coarse grained, after quenching and tempering. However, he did not ascertain the effect of grain size upon temper brittleness, as was done by Swinden and Bolsover. White and Clark<sup>17</sup> also tested coarse and fine grained steels at the various tempering temperatures up to 1200 deg. F. and showed that fine grained steels possess the maximum impact resistance over the major portion of the temperatures examined. This was true whether the specimens were held 1 or 1000 hr. at temperature. From the above results, it may be stated that the fine grained steel possesses a greater impact resistance than coarse grained steel, although the latter is less susceptible to temper brittleness than the fine grain aggregates.

*Influence of Grain Size Upon Brittleness at Sub-Zero Temperature:* To determine the effect of austenite grain size variations upon the impact resistance at sub-zero temperature, Herty<sup>19</sup> tested four series of steels made by different methods of deoxidation (method of deoxidation reported under the effect of grain size upon aging) by means of the Charpy Impact Test (Izod notch) at 75 deg. F. and minus 40 deg. F. He found that the loss of impact resistance was more marked in the coarse grained steels than in the fine grained aggregates. The loss of impact resistance decreased progressively from 95 per cent in the coarse grained steels, which contained the greatest amount of dissolved oxygen, to 24 per cent in the fine grained steels which contained the least amount of oxygen.

*Influence of Grain Size Upon Aging:* To illustrate the effect of grain size and deoxidation upon the aging characteristics of various steels, Herty<sup>19</sup>

<sup>18</sup> H. W. McQuaid, Transactions, A. S. M., Vol. XXII, 1934, p. 1017.

<sup>19</sup> C. A. Rowland and C. Upthegrove, Transactions, A. S. M., Vol. XXIII, 1935, p. 187.

<sup>20</sup> H. W. Graham, Transactions, A. S. M., Vol. XXII, 1934, p. 926.

<sup>21</sup> R. H. Kenyon, Transactions, A. S. M., Vol. XXII, 1934, p. 1099.

<sup>22</sup> W. E. Ruder, Transactions, A. S. M., Vol. XXII, 1934, p. 1142.



quenched a series of four steels and aged them at room temperature for two weeks. He also determined the characteristics of these steels after they were normalized (air-cooled), compressed 15 per cent, heated for 5 min. at 450 deg. C. (842 deg. F.), and then aged them at room temperature for one day. Before and after each aging treatment, Izod tests (impact) were made. The results of these treatments are summarized in Table III.

The steels listed in Table III were made as follows: Steel No. 1, a rimmed steel deoxidized only with manganese; steel No. 2, a silicon-killed steel deoxidized with manganese and silicon; steel No. 3, a semi-killed steel deoxidized with manganese and a small amount of silicon and aluminum in the ladle; and steel No. 4, a dead-killed steel strongly deoxidized with silicon-manganese followed by deoxidation with excess of aluminum. The dissolved oxygen content and the austenitic grain size of these four steels decreased progressively from steel No. 1 to steel No. 4.

An analysis of Table III shows that the change in hardness, after quenching, is the greatest in the steel which gave the greatest loss of impact value (88.2 per cent) after strain aging and that the data is in every way consistent with respect to these two properties (hardness increase and loss of impact).

The results of the work of Swinden and Bolsover<sup>11</sup> upon the effect of grain size upon the aging characteristics of mild steels, based upon tensile and Izod specimens quenched from below and above the thermal critical range and aged at room temperature, showed that (a) the hardness increase was of the same magnitude in the fine and coarse grained material upon aging, (b) the increase in maximum tensile strength was of the same proportion in the fine and coarse grained steels, (c) the yield point of the coarse grained material increased more rapidly up to 14 days' aging than the fine grained material, (d) the decreases in the reduction of area and elongation were practically of the same ratio, and finally (e) the Izod impact value of the coarse grained steel markedly decreased with aging, while the fine grained material increased slightly.

The above investigators also strained material (15 per cent) and noted that after cold working and tempering to 250 deg. C. (842 deg. F.), or aging at room temperature for approximately four months, that the coarser grained material yielded

a greater loss of toughness than the fine grained material when subjected to the same degree of cold working and aging.

These results, supplementing Herty's, indicate that the degree and method of deoxidation influence the aging characteristics, inasmuch as the method of deoxidation influences the amount of oxygen retained in solid solution in the material, which in turn will regulate the aging properties and characteristics of coarse and fine grained material. From these deductions, it seems logical to assume that the aging of carbon steels is accelerated by the oxygen present in solution in the material. This assumption is further substantiated by observation (e) in the foregoing paragraph, which shows that the loss of impact in coarse grained steels may be attributed to precipitation that is taking place during aging, while in the fine grained steels very little precipitation occurs.

*Effect of Grain Size Upon Decarburization:* A study of the effect of grain size and its influence upon the surface decarburization was made by Rowland and Upthegrove<sup>12</sup>. They found that the rate of decarburization varied with grain size and that the coarse grained steels possess a greater decarburizing tendency than the fine grained material. They also studied the effect of time and temperature on the character and width of the total decarburized zone for fine and coarse grained steels and revealed that (1) the relative widths of the ferrite bands of coarse and fine grained steels remained practically independent of the time of the decarburization temperature, and (2) the maximum width of the ferrite bands of both fine and coarse grained steels takes place when decarburization occurs at approximately the  $A_1$  transformation range.

*Grain Size Versus Machineability:* The effect of grain size upon the machineability of steel has not received much attention, although McQuaid states that metal is removed more freely from coarse grained steels than from finer grained material, but the latter gives a smoother finish surface. Others reported that after quenching and tempering, metal may be removed more rapidly from fine grained steels. Swinden and Bolsover<sup>11</sup>, in numerous machining tests, failed to observe any difference between the machining characteristics of fine and coarse grained steels. Graham<sup>13</sup> also came to the same conclusion as Swinden and Bolsover after studying the machineability of Bessemer screw stock. Thus, from these investigations, no definite

conclusion can be obtained until further information is submitted for analysis.

*Effect of Grain Size Upon Piping:* Epstein, Nead and Washburn<sup>14</sup> showed that fine grained steels tend to be more deeply piped than normal commercial steels, since they require a larger amount of silicon and aluminum to refine them. Moreover, they showed that fine grained material produces a lower percentage yield than ordinary commercial steels, since more scrap-ping is necessary to remove the deeper pipe. They also claim that economy may be achieved in casting fine grained steel into ingots by the use of hot tops.

*Effect of Grain Size Upon Deep Drawing Characteristics:* Kenyon<sup>15</sup> in a brilliant paper upon the effect of grain size upon the deep drawing revealed that surface smoothness is a function of grain size. He showed that the finished surface conditions of fine grained mild sheet steels were much superior to those of coarse grained steels since the latter became rough after deep drawing whereas the fine grained steel remained smooth and uniform.

*Effect of Grain Size Upon Magnetic Properties:* Ruder<sup>16</sup> correlated the existing data of the effect of grain size upon the magnetic properties of steel and then showed that the hysteresis, coercive force and residual all decrease with increasing grain size. This condition varies with the prior treatments whether mechanical or chemical and, consequently, the effect of grain size cannot readily be ascertained unless a complete series of tests are run, as was done by Dr. Ruder.

### Summary

Since the scope of this paper, which appeared in three sections, was to present a concise version of grain size, Table IV tabulates briefly the effect of grain size upon some of the physical, chemical and structural properties and characteristics of steel.

The results are variable since, as has been repeatedly stated, they are influenced by the melting procedure, method of deoxidation, casting temperatures, soaking temperatures, and prior mechanical and thermal treatments.

### Acknowledgment

The author wishes to express his sincere appreciation to Mr. R. F. Schempp, metallurgist of the Crucible Steel Co. of America for his many conversations and valuable discussions during the course of this survey.



*Stainless Steel Mural Colored Black, Gray and Red by Oscar Bach*

# Colored STAINLESS STEEL

By T. W. LIPPERT

*Metallurgical Editor, The Iron Age*

THE coloring of stainless steel's a contradiction still. Easy, but difficult; momentous, but trivial; much talked about, but nurtured secretly—time only will decide the when, the how and the how much.

IN this perispherical and trylonic age, it's a supine metal manufacturer who damn well doesn't realize that his particular product is engaged in a cut-throat competitive battle. Only one rule is recognized, and that's "devil take the hindmost." The battlecry is to exploit and defend existing outlets, all the while experimenting, diversifying and propagandizing to constantly encroach on outlets dominated by other metals.

Stainless steel, much as it may profess to hold aloof from the common battle, is all the same a quite familiar figure in the competitive struggle. It's true, of course, that competitive blows handed out by stainless frequently lack a decisive wrist-snap, but such is less an indication of weakness in spirit but more a reflection of general

weariness and lack of cooperative effort traceable on occasion to a flurry of intra-mural gouging.

If, for any competitive application, strength at low cost is specified, then stainless hasn't much of a look-in. If it's a question of a strength-weight ratio, then stainless frequently can slug its way up front for some consideration. If resistance to corrosion, particularly severe or diversified corrosion, is the desideratum, then almost inevitably stainless alloys occupy the van in the battle of metals.

Such is the competitive functional position of stainless alloys today. But even beyond this, snap judgment would in addition credit stainless with aesthetic advantages. The alloys take a polish of mirror brilliance, which seemingly immediately creates sizable outlets of purely a decorative nature, or outlets requiring in addition to decoration a measure of corrosion resistance. But note well that this brilliant finish, just like so many other things in this mad world, is far from being an unmixed blessing.

Stainless steel with unfortunate proficiency picks up disfiguring fingermarks and greasy films, and in decorative applications the visible record of

day-to-day vicissitudes can be almightily discouraging. And the brilliant finish, spectacular as it often is in moderate doses, can if used in large amounts or ill-advisedly give stainless' most fervent partisan the willies. To be sure, there's no denying a limited aesthetic usage, what with the Empire State and Chrysler buildings sheathed in stainless and every household stocked with stainless appliances and knick-knacks, oftentimes all too many knick-knacks. But in such applications corrosion resistance plays as much or more important a role than appearance in the selection of the material.

To titivate the frequently unprepossessing exterior of stainless has been the object of diverse amount of effort during the past few years. These artifices are in themselves an admission of aesthetic limitations, proof of the cognizance of some producers that only a foot is in the door of outlets that conceivably might account eventually for sizable tonnages at worthwhile prices.

Quite early in the game buffing was varied to furnish surfaces ranging from a grayish satin (No. 1) to a bright mirror-like (No. 7) finish. At a later date surfaces were pebbled or



similarly roughened to tone down brightness and reduce the visibility of fingermarks, scratches, etc. Or, as in the Arduro process of the United States Plywood Co. (work done by Regal Art Glass Co., New York) a blast of fine silica is employed to obtain a degree of shading due to the depth of cutting. Chemical darkening also has been used to vary the reflectivity of stainless, and, more recently, elaborate practices have appeared to create surface decoration, and contrasts, as for instance the etching and rolling-in of designs, such as exploited by Sharon Steel Corp., and rolled-in stripes and patterns in the prefinished material of Acme Steel Co.

For color contrasts high temperatures have on occasion been used to fuse enamel onto the metal; or non-ferrous metals are used sometimes as appliques or contrasting designs in the decorative arts; or to liven an installation there has been occasional use of ordinary paint and lacquer. It is quite evident that the efficacy of these practices is most limited. The former dealing only with shadings of bright and dark do not even touch the real problem; and the latter are obvious stop-gaps employed merely for want of something better. High temperature enameling is of course commercially impractical, and painting and lacquering are subject to discoloration, peeling and disintegration. And, there is little promise in electrolytic coloring, such as the Electrocolor technique of United Chromium, Inc. which even though producing beautiful coloration of any shade on any metal has nonetheless little wear resistance and requires an overcoat of clear lacquer to protect the colored film from exposure and handling.

A straightforward attack would of course involve a coloring of the stainless steel itself. Such a coloring process, for maximum commercial exploitation, must needs be inexpensive, foolproof, require no protective lacquer, and be of wide chromatic range. Even more important, the color should certainly be integral with the steel's surface and have no deleterious effect on the corrosion-resistant characteristics of the stainless alloys.

Various schemes of coloring stainless have been and are cosseted by several members of the industry, to the tune of considerable money and energy. Nonetheless, stainless producers as a group are emotionally divided into two schools of thought. By far the majority hew to a cold skepticism, and privately level numerous strictures against coloring of stainless in gen-

eral. The contention is that such coloring is technically impractical and/or prone to blanket out the very essence of the steel, i.e., the familiar intrinsicity or identity of the metal, or what have you. Even in gracious intervals, this group admits only that *if* such integral coloring be perfected and exploited it would be interesting merely as a specialty enterprise and would involve only a piddling volume of steel.

The other, admittedly smaller group takes the other extreme, of course. The prophesy is that coloring would not only impart to stainless the ultimate in versatility, but would immediately and progressively favor production figures with commensurate unguency on rather sore profit statements.

The writer, with conventional editorial shilly-shallying, takes a very undramatic midway position. It is believed that dependable coloring technique can well be highly beneficial to the stainless steel industry acknowledging of course at all times that stainless' primary role is functionally that of structural strength and corrosion resistance—aesthetic considerations, that is coloring, being quite secondary.

But, a secondary role is not necessarily an insignificant role. In this instance, it can assume considerable importance. There's no doubt that a sizable demand already exists for colored stainless steel, and even a sketchy market survey brings to light numerous unsuspected, albeit small-tonnage, applications of such diversity as to be indicative of a far larger potential outlet. In fact, coloring need not be merchandized solely for its aesthetic appeal; numerous inquiries have appeared stressing only identification and surface protection.

#### Conditioned Market Exists

Architects are most vocal in demanding colored stainless steel, particularly Government architects who have seen the colored stainless exhibit (prepared by Oscar Bach) in the Procurement Division at Washington. Bright metal's use in architecture is limited, which limitation would disappear with the availability of color. In architecture aluminum has a particularly spectacular competitive edge on stainless, primarily because Aluminizing makes available any color the architect might specify. A typical recent instance of stainless' vulnerability is the Los Angeles Federal building, which would have used 40 tons of colored (gray) stainless for span-

drels and exterior trim, and stainless for toilet stalls in the same building colored to eliminate finger marking. The former project went to aluminum, and the latter was finally made of painted steel, both because of inability to secure colored stainless. These two are just random examples; there have been many such projects. In fact, it's more than likely an immediate potential yearly architectural outlet of a thousand or more tons of stainless exists, to be satisfied just as soon as coloring becomes commercially practicable.

For purely decorative applications, mostly interiors, the demands are fully as insistent, although the tonnages involved are perhaps not individually so large. The new stainless steel trains use colored aluminum or painted steel for interiors, an outlet which would be in competitive reach of colored stainless. Naval and private ship interest both are constantly demanding colored stainless for interior trim, and other decorative possibilities range from the simplest of trim in offices decorated in the modern manner to vaults in banks. Regarding the latter, a large New York bank recently specified colored stainless for a vault, but finally used engine-turned carbon steel protected with a clear lacquer, only to later have the installation discolor with rust spots.

Miscellaneous applications, immediately available to colored stainless, are quite numerous in number and interestingly diverse in character. Certain stove companies desire colored stainless for trim, and one large maker of electric stoves wants to use a black color on the inside of stainless shells holding heating elements in order to prevent unsightly heat discoloration and cut down squawks from finicky housewives. One large maker of radios would like to use colored stainless mounting plates to insure good appearance and permanent rust resistance. Such plates now are made of ordinary steel plated or sprayed. Still another radio maker desires thin stainless (non-magnetic) steel to construct the entire body of smaller models, such shells to be backed up with sound-proofing material and decorated on the outside with permanent colors. Several furniture makers are asking for colored stainless to incorporate into new designs, and a large maker of pen points desires a gold color for stainless steel points which will stand up under the relatively severe corrosive attack of ink. A maker of industrial controls would like to finish stainless steel palm-

operated push buttons in red and in black, to take the place of painted buttons now used and which are short lived due to abrasion and to corrosion from oils and chemicals carried by workers' hands.

All these possibilities are merely a cross-section of a large potential market for colored stainless, a market which certainly also includes the plumbing industry, cooking utensils, decorative arts, etc. The outlets are there to tap immediately, but the coloring process for stainless which will do the tapping must be comparatively cheap, fool-proof, in no way impair the natural corrosion resistance of the stainless, and have wide chromatic versatility. It seems well within reason that admitting a coloring procedure of such caliber, annual stainless outlets so opened should aggregate two or three thousand tons or more, with future growth dependent only on the ingenuity of commercial designers and architects.

It is of course obvious that most of the outlets for colored stainless mentioned herein are already serviced by colored aluminum, painted or lacquered common steel, or steel protected by electrocoatings. Furthermore, it is apparent that in most of the applications the result desired is not only coloring but at the same time a high degree of corrosion resistance. In fact, the borderline between coloring and protection is not a bit well defined, but it must be assumed that coloring must never be performed at the expense of corrosion resistance, and the corrosion resistance must at all times be quite high.

Stainless steel, being itself corrosion resistant, serves as the best possible base to carry a colored surface, and, if the latter has no deleterious effect on the resistant properties, the colored material should stand up indefinitely in all applications. However, it has on occasion been contended that if the typical stainless steel surface is going to be blanked out by using a color, much money can be saved in any particular installation merely by using ordinary carbon steel protected on the surface with a colored lacquer or paint having a high degree of corrosion resistance.

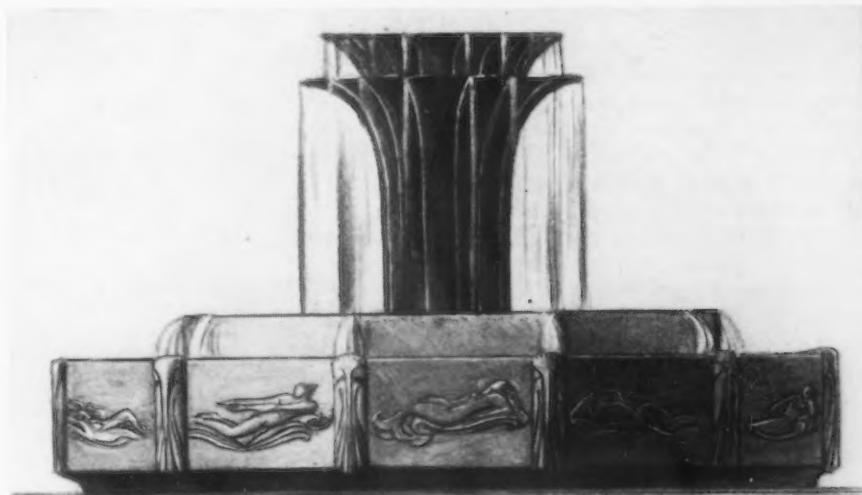
Such a viewpoint presupposes that ordinary steel protected by a coating of stable lacquer or paint will stand up equally as well as stainless, either uncoated or covered with a similar lacquer or paint. There have been certain tests showing such to be the case, but the bulk of experimental work indicates that if the base metal

itself is resistant a far longer life may be expected under most corroding conditions than for plain steel with a surface protection of lacquer.

To investigate this problem, one large company recently prepared ordinary automobile steel panels and stainless steel (0.10 C, 18.38 Cr, 8.97 Ni, 0.63 Mn, 0.68 Si, 1.16 Co) panels by coating them all with a priming coat of lacquer followed by a cover coat of black air-drying lacquer of high corrosion resistance, similar to the lacquer used on the inside of beer cans. All the panels were then ex-

posed to corrosive conditions, whereas the 18-8 steel similarly coated stands up indefinitely.

The foregoing is judged as showing that an attractive market exists for colored stainless steel, a market which is currently competitively in the hands of Alumilited aluminum, or painted, lacquered or electroplated carbon steel. Furthermore, it has been shown that carbon steel painted or lacquered frequently breaks down under corrosive conditions, as against the permanency of coated stainless steel, or stainless colored in such a



**L**ARGE stainless steel fountain for Skinner Silk Co., which will be seen in the building Man, His Wear, His Sports, at the World's Fair. The figures around the base, designating the four seasons, represent feminine beauty, and will be colored gold by the Bach process. Four other colors will serve as trim, and the fountain is of natural stainless in the form of a lotus flower, highly stylized.

posed for three months to a 20 per cent sodium chloride spray atmosphere, and a similar set totally immersed in a 0.5 per cent ferric chloride solution containing 10 per cent sodium chloride, which solution is generally used for accelerated pitting of stainless steel.

In the 20 per cent salt spray atmosphere, the lacquered stainless steel after three months exhibited no noticeable change in the coating, whereas the standard automobile body steel blistered badly during the same time interval. The coating on the automobile body steel failed completely after only one month's immersion in the ferric chloride-sodium chloride solution, whereas the stainless similarly coated stood up for the three-month period, there being no blisters in the coating. There was, however, some discoloration by ferrous hydroxide, but on removing this the coating exhibited its original luster. It was indicated, therefore, that the coatings were not sufficiently impervious to moisture to protect plain carbon steel when sub-

manner that inherent corrosion resistance is not impaired. Carbon steel electroplated with a number of different types of attractive and corrosion resistant metals of course would always be partly competitive, particularly when colored chromium platings now being developed come onto the market. But even such coatings are subject to the ills of plated metals on a base metal highly vulnerable to corrosion, as breaks in the protective coating can result in unsightliness and rapid breakdown of the composite.

Thus with the market and advantages of colored stainless steel established, the problem becomes one of how stainless can be colored, what work has been done in such a direction and what is the present status of the problem.

#### Heat Tinting Investigated

One of the earliest patents the writer can find dealing with the coloration of stainless is that issued to Colin Fink and assigned to the Allegheny Steel Co. Apparently nothing



has been done with this process. The patent, No. 1,893,821, Jan. 10, 1933, describes the use of a mixture of sulphuric and chromic acids to form a surface mordant, subsequently to be immersed in dye to form a lake. An Englishman, Hadfield, also has a patent dealing with passivating which mentions that under certain conditions a color is obtained. Still another patent mentions the use of hydrochloric acid and certain metallic salts to color stainless, and there are various other patents which in a way touch tentatively on the coloration of chromium and chromium-nickel steels. However, duplication of the conditions mentioned in certain of the later patents has failed to produce satisfactory color, or in some instances any color at all. Another patent covers the flashing of an electrocoat of copper onto any steel, stainless included, and subsequent heat coloring of the copper. This procedure gives really beautiful and rich colors, even the most delicate of pastel shades. But unfortunately the corrosion resistance is not satisfactory and the film must be protected with a clear lacquer. And since colored lacquers will stand up as long as a clear lacquer, the colored lacquer might just as well be used in the first place.

Another interesting patent on coloring procedure is just about what would be expected, a series of claims on the heat tinting of stainless or rustless alloys. The patent, No. 1,977,270 was issued in 1934 to Alexander L. Feild, who also perfected the unique production metallurgy employed by Rustless Iron Corp. The patent describes the pickling clean of any of the straight-Cr or Cr-Ni rustless alloys, and heating the surface until it tints to a color of, say, old gold. Such coloration progressively passes through the various colors light straw, dark straw, yellowish-brown, red-brown, deep purple, violet, blue and green, as the steel is gradually heated, the color band ranging from light straw to yellowish-brown being broadened out and persisting longer than the other colors. As regards the temperatures required, the old gold color can be secured when the surface reaches a temperature of about 600 deg. F., although the appearance of the desired heat tint depends upon a number of variable factors, such as the size of the article being treated, the temperature of the agents imparting heat to the article, the velocity and composition of the gases surrounding the article during the heating period and the length of time that the article is subjected to the

## CORROSION TESTS

### TEST I—Relative Resistance of Colored (Bachite) and Untreated Cr and Cr-Ni Alloys

Test Specimens	Observations After			
	24 Hours	48 Hours	72 Hours	100 Hours
IN 20 PER CENT BRINE SOLUTION				
6 Cr.....	surface corroded	surface corroded	badly corroded	very badly corroded
18 Cr.....	pits formed	pitting continued	slightly corroded	corroded
18 and 8.....	no effect	no effect	rust on edges	rust on edges
6 Cr, Colored.....	no effect	no effect	two pits formed	few small swellings
18 Cr, Colored.....	no effect	no effect	no effect	no effect
18-8, Colored.....	no effect	no effect	no effect	no effect

#### IN 5 PER CENT FERRIC CHLORIDE AND 10 PER CENT BRINE SOLUTION

6 Cr.....	corroded	corroded	badly corroded	very badly corroded
18 Cr.....	pitted	pitting continued	badly pitted	very badly pitted
18 and 8.....	one pit	three pits	three pits	three pits
6 Cr, Colored.....	no effect	no effect	no effect	many small swellings
18 Cr, Colored.....	no effect	no effect	no effect	two small swellings
18-8, Colored.....	no effect	no effect	no effect	no effect

#### CONTACT CORROSION IN 5 PER CENT FERRIC CHLORIDE AND 10 PER CENT BRINE SOLUTION

Test Specimens	Observations After				
	6 Hours	24 Hours	48 Hours	72 Hours	100 Hours
6 Cr.....	badly corroded, solution turned green	very badly corroded, solution green	very badly corroded, solution green	very badly corroded, solution green	very badly corroded, solution green
18 Cr.....	deep pits	deep pits, solution green	pitted, solution green	badly pitted, solution green	very badly pitted, solution green
18 and 8.....	pits forming	pitted, solution green	pitted, solution green	badly pitted, solution green	badly pitted, solution green
6 Cr, Colored.....	no effect	no effect, solution unchanged	no effect, solution unchanged	few small pits, solution unchanged	small pits, solution unchanged
18 Cr, Colored.....	no effect	no effect, solution unchanged	no effect, solution unchanged	no effect, solution unchanged	few small pits, solution unchanged
18-8, Colored.....	no effect	no effect, solution unchanged	no effect, solution unchanged	no effect, solution unchanged	small pits on edges, solution unchanged

All specimens 2 in. wide, 2 in. long and  $\frac{1}{8}$  in. thick. Analysis of 6-Cr alloy is 0.07 C, 0.42 Mn, 0.018 P, 0.016 S, 0.34 Si, 5.63 Cr, 0.52 Mo and no nickel. Analysis of 18-Cr alloy is 0.09 C, 0.44 Mn, 0.019 P, 0.021 S, 0.33 Si, 18.42 Cr, no molybdenum and 0.18 Ni. Analysis of 18-8 alloy is 0.06 C, 0.47 Mn, 0.016 P, 0.018 S, 0.38 Si, 18.52 Cr, no molybdenum and 9.39 Ni.



# COMPARATIVE DATA

## TEST II—Relative Corrosion Resistance of Colored (Bachite) 6 Cr Steel and Untreated Stainless (18-8) Alloys

Specimen	Weight Before Test, Grams	Weight After Test, Grams	Loss of Weight, Grams	Surface Area, Sq. In.	Loss of Weight, Grams Per Sq. In.	Change In Corrosion Resistance, Per Cent as Compared With 18 and 8	Description of Test
18 and 8.....	31.02300	29.68170	2.34130	8.582	0.273	.....	10 min. in boiling (180 deg. F.) 1:1 HCl
6 Cr, Colored...	33.52370	33.50920	0.01450	8.544	0.0017	+16,058	
18 and 8.....	30.70010	30.72835	0.06175	8.568	0.0072	.....	10 min. in super-saturated solution of FeCl <sub>3</sub> in HCl
6 Cr, Colored...	33.54625	33.52745	0.01880	8.494	0.0022	+327	
18 and 8.....	31.09125	30.17060	0.92065	8.587	0.108	.....	15 min. in boiling 20 per cent H <sub>2</sub> SO <sub>4</sub> poured into beaker
6 Cr, Colored...	32.66105	32.15170	0.50935	8.352	0.060	+180	
18 and 8.....	31.10005	30.20875	0.89130	8.506	0.097	.....	5 min. in 20 per cent H <sub>2</sub> SO <sub>4</sub> at boiling temperature (220 deg. F)
6 Cr, Colored...	32.81955	31.96610	0.85345	8.342	0.102	+102	
18 and 8.....	30.80220	30.60915	0.19305	8.602	0.022	.....	5 min. in boiling 10 per cent HNO <sub>3</sub> and 2 per cent HF
6 Cr, Colored...	33.52890	29.87000	3.65890	8.522	0.429	-1910	

Six per cent chromium specimens were colored black. Size of specimens was 2 in. long, 2 in. wide and  $\frac{1}{4}$  in. thick. Analysis of the 18 and 8 was 18.60 Cr, 8.90 Ni and 0.095 per cent C. Analysis of the 6 per cent Cr specimens was 5.63 Cr, 0.52 Mo, and 0.06 per cent C. For colored specimens, only the treated surfaces were exposed, i.e., no edges and no breaks in surface color.

## TEST III—Relative Corrosion Resistance of Colored (Bachite) and Untreated Stainless Alloys

Specimen	Weight Before Test, Grams	Weight After Test, Grams	Loss of Weight, Grams	Surface Area, Sq. In.	Loss of Weight, Grams Per Sq. In.	Change In Corrosion Resistance, Per Cent as Compared With 18 and 8	Description of Test
18 and 8.....	37.63125	37.40310	0.22815	10.8466	0.021	.....	5 min in 20 per cent H <sub>2</sub> SO <sub>4</sub> heated to 212 deg. F.
18-8, Colored...	38.12080	38.12080	0.00000	10.5400	0.000	Infinite (?)	
18 and 8.....	37.40205	35.81915	1.58290	9.7697	0.162	.....	10 min. in Aqua Regia (3 HCl+2 HNO <sub>3</sub> )
18-8, Colored...	38.96870	38.85800	0.11070	10.7960	0.010	+1620	
18 and 8.....	38.36350	38.10150	0.26200	11.2483	0.023	.....	10 min. in boiling 10 per cent HNO <sub>3</sub> +2 per cent HF, at 240 deg. F.
18-8, Colored...	38.98990	38.98320	0.00670	10.5400	0.0006	+3830	
18 and 8.....	38.73975	38.49250	0.24725	11.3499	0.021	.....	10 min. in boiling 1:1 HCl, at 180 deg. F.
18-8, Colored...	38.16765	38.15996	0.00769	10.5912	0.0007	+3000	
18 and 8.....	38.61810	38.56100	0.05710	10.6010	0.005	.....	10 min. in a super-saturated solution of FeCl <sub>3</sub> in HCl, at room temperature.
18-8, Colored...	38.15925	38.15335	0.00590	10.6840	0.0005	+1000	

In each test the color was black. Only the treated surfaces were exposed, i.e., no edges and no breaks in surface color. Analysis of the 18 and 8 was 18.60 Cr, 8.90 Ni and 0.095 per cent C.

heating action. Following such heat tinting, it is advisable to give the steel a passivating treatment by dipping in an aqueous solution of 10 per cent nitric acid and washing in running water.

Another examination of the heat coloration of stainless alloys was made by the Westinghouse Research Laboratories several years ago, although the study actually was mostly a by-product of an investigation of experimental protective atmospheres for new annealing furnaces built for Ford. Samples of 18 and 8 and of 14-Cr steels were cleaned and buffed and passed through the furnace, being subjected to temperatures near 1560 deg. F. for from 30 sec. to 48 min. in hydrogen atmospheres containing very small percentages of oxidizing gases, with humidities corresponding to dew points in the neighborhood of -5 deg. F. The color films so produced ranged through the visible spectrum, and were thin, frequently tightly adherent and in some cases quite resistant to corrosion. The character of the film depends to a certain extent on the nature of the atmosphere, and it is possible to secure films that are easily loosened by pickling so that final removal by buffing is comparatively easy.\*

No complete study was made, however, on the effects of oxide films produced in the Westinghouse experiments or by the Feild process as to behavior of the colored alloys under atmospheric or other corrosive conditions. However, since included oxides often are blamed for corrosion failures of stainless steel, it is well to be skeptical as to the oxide films being highly corrosive-resistant. Such a procedure perhaps could be of some value as a means of producing artistic effects for display in protected locations. In general though heat tinting can be assumed as not being the answer to commercial coloration of stainless steel, mostly because of this possible reduction in corrosion resistance, the loose adherence of the scale in some instances, and the high temperature and careful control of atmosphere required to produce the effects.

\* Some work has been done on the dyeing or pigmenting of the more adherent of these types of films, as is done in Alumilting of aluminum and coloring of magnesium alloys. Results, however, have not been promising. Parenthetically, it might be mentioned that some experimenters prefer use of oil-soluble dyes because oxide films are penetrated more thoroughly and there is no danger of chalking on exterior exposure, although there is danger of loss of gloss and discoloration. Pigments penetrate oxide films very little (the pigment particles are caught on the surface just like sand in water would not penetrate a sponge), but tend to offer generally greater opacity to ultra-violet rays, thus retarding breakdown, and often increase toughness and abrasion resistance of oxide film.

### Ludlum and Bach Processes

All the foregoing somewhat iconoclastic treatment of coloration as applicable to stainless steel leads up to two processes which have all the earmarks of either being the final answer to the commercial coloration of stainless, or at least great steps in the correct direction. Unfortunately, neither process can at this time be completely examined. The Coloron process of Allegheny-Ludlum Steel Corp. (developed originally by Clements Batcheller) is still subject to the ministrations of eight or ten technical men and is being kept under wraps for the time being. Somewhat more is known about the Bachite process of Oscar Bach, Rockefeller Center, New York, probably the foremost metal craftsman of this country; for after several years' experimentation, a captive organization, the Bachite Development Corp., is now engaged in licensing his process and prone to tell a little more about its characteristics. For both processes, however, the information contained herein is the first that has been published.

As regards the Coloron process, the writer has seen some quite beautiful colors which certainly enhance the appearance of stainless steel. By visual examination the colors certainly appear integral, but no information is known as to their abrasion resistance or corrosion resistance, although both are suspected as being fairly satisfactory. The Coloron process uses some type of chemical solution (what, not known), which is effective on any type of steel with a chromium content high enough to resist the solution. Heat is not necessary in the process, although heating (several hundred degrees) will accelerate coloring action. One basic blue-black color, of considerable beauty, is obtained, and another basic color which is approximately a translucent gold-bronze is used and varied at will to secure other colors, such as a rich navy-blue and an off-shade red, the latter having not much zip and being by no means vermilion. This basic gold-bronze is also capable of variation to a light shade of color with a greenish tinge, although the green is also inclined to be pretty sickish and by no means rich.

Bachite, the process controlled by the Bachite Development Corp., has been developed and improved somewhat spasmodically over the past several years. That it is now just being exploited commercially is, the writer believes, traceable to Bach's skepticism regarding the protection offered by patents and possibly to the fact that perhaps the technique is so simple

that there might be fear that once some licenses were issued a complete control might be somewhat difficult. Be that as it may, though, additional protection has been secured and licensing is under way.

Certain colors produced by the Bachite process are extremely attractive, especially black, gold, bronze, purple and blue, and gradations in between. Oddly enough, Bachite and Coloron resemble each other in that the former also turns out a rather sickly-looking red and green. Most of the good colors of Bachite seemingly are adherent to or integral with the surface, and for those colors such as red and green not produced so well the Bachite surface gives the best possible bond for touching up with a desired lacquer color. Or, at least such will likely be the practice until a good Bachite red and green are developed, which Oscar Bach hopes will be quite soon. A stainless steel exhibit, liberally interspersed with Bachite colors has for several years been in the Procurement Division of the Treasury Department at Washington, which has excited the avidity of Government architects, as mentioned before. The stainless escalators in the Pennsylvania Railroad station, New York, are Bachited, several World's Fair exhibits are being so colored, and the large murals for Climax Molybdenum Co., first exhibited at the Metal Congress in Detroit last October, were colored by Bach. A mural of the same type is reproduced on page 38. Note that there is a four-color effect; the gleaming natural finish of stainless steel, a deep black, a gray (made by roughening a black finish), and a vermilion red. Although Bach makes no definite statement, the writer believes that the vermilion shown is a rather weak Bachite red dressed up with vermilion lacquer.

Bachite can be applied to any of the straight-chromium or chromium-nickel stainless steels, even when the alloy content is quite low. The surface of the steel of course has to be pickled. For the delicate colors such as the golds, a lustrous to satin finish first has to be buffed onto the stainless steel, but for the darker colors a rougher surface is if anything preferable. Heat is used in the Bachite process, the temperatures being quite low, that is on the order of several hundred degrees, which is far below any harmful level either as regards to metallurgy of the steel or as regards to physical distortion. This heat can be applied all over by using a furnace, or can be used locally for dif-



ferential coloring as in the mural shown on page 38. A chemical solution (colorless) is sprayed onto the surface prior to heating. Most of the Bachite colors are quite adherent, seemingly being integral with the surface and conforming to the texture of the steel, although certain of the colors can be scraped off if the abrasion is severe.

Bach claims that his coloring process has a tendency to lift the surface hardness and abrasion resistance of stainless steels. The writer, however, has seen no data to support this contention, although it would occasion little surprise if such is the case. But, undoubtedly one of the most startling characteristics of Bachite is the extremely high corrosion resistance of the colored films so produced. This characteristic of course weighs in favor of this coloring technique. In fact, the increase in corrosion resistance, in part verified by at least several disinterested laboratories, is so astonishing in some instances that Bach claims the process has value far above that of mere coloring alone. That is, it has value in improving the resistance of certain low-alloy steels to certain types of attack to such an extent that the steels can be used to replace more expensive highly alloyed steels for certain applications. The writer will certainly take no stand regarding this contention, but rather sets down the data on numerous corrosion tests so that the reader may reach his own conclusion.

#### Corrosion Data for Bachite

In order to determine the relative corrosion resistance over a long period of time (100 hr.), representative specimens ( $2 \times 2 \times 1/16$  in.) were made from the same annealed and pickled sheets. After applying the Bachite process to produce a black surface color on one-half of these specimens, they were compared with the unprocessed samples in various corrosive media. Of course, in all tests on the colored steel, only the colored surface was exposed, i.e., no exposed edges or no-chips in colored surface. The tables on page 42 show the relative corrosion resistance of the various grades of chromium steels up to 100 hr., in a 20 per cent aqueous brine solution. At the end of each 24-hr. period, the samples were removed, examined, and replaced.

The qualitative data in the tables show that the corrosion resistance increases from the unprocessed 6-Cr steel to the unprocessed 18-8 stainless steel. It is also apparently shown that the corrosion resistance of the Bachite processed material increases from the

6-Cr to the 18-Cr steel, and that, after 100 hr. of immersion the processed 18-Cr steel is as good as the unprocessed 18-8 stainless steel. If the time element was increased, undoubtedly the 18-8 would be superior to the 18-Cr steel. However, the results indicate that for the duration of this test (100 hr.) colored, processed low-alloy 6-Cr steels are as good as KA-S (18-8). Furthermore, they show that processed (Bachite) 18-Cr steel is superior to unprocessed stainless 18-8.

To accentuate the effect of corrosion in long time tests (100-hr.), a corrosive medium of 5 per cent ferric chloride and a 10 per cent brine solution was used instead of a 20 per cent aqueous brine solution. Representative samples were submerged and examined at the end of each 24-hr. period. The results obtained are tabulated in the tables on page 42.

The tabulated data may be summarized as follows: (1) The corrosion resistance of the unprocessed material increases with the alloy composition; (2) stainless 18-8 steel is superior to both 18-Cr and 6-Cr steels; (3) processed low-grade 6-Cr steel is as good as normal 18-8 austenitic steel; (4) processed 6-Cr steel is greatly superior to the unprocessed 18-Cr steel; and (5) processed 18-8 stainless steel is superior to both the processed 18-Cr and the processed 6-Cr steels.

Since the data in the tables show the relative corrosion resistance of processed and unprocessed chromium steels in long time tests in corrosive solutions, the effect of contact corrosion was next investigated. The contact was obtained by paraffining the ends of a glass rod to each specimen. Two drops of paraffin were also placed on the surface of each sample—one on each side away from the glass rods. The samples were then partially submerged in the ferric chloride (5 per cent) and brine (10 per cent) solution for 100 hr. Specimens were examined after 6, 24, 48, 72, and 100 hr. respectively.

To obtain a true picture of the effect of contact corrosion upon the treated and untreated material, it is essential to note the effect of the time element upon contact corrosion before any relative comparison can be made. This can best be accomplished by describing the action of the corrosive medium upon the material at different time intervals as is done below:

#### 6 Per Cent Chrome:

After 6 hr. contact corrosion, the unprocessed 6-Cr steel was badly corroded. The color of the ferric chloride

and sodium chloride solution turned from amber to green. After 24 hr., the specimens were very badly corroded. Longer time intensified the corrosion of the specimens, and formed a very heavy solution line.

#### 18 Per Cent Chrome:

After 6 hr. contact corrosion, deep pits were observed to form on the 18-Cr steel surfaces and corrosion began around the paraffin drops and at the water line. The amber ferric chloride and brine solution remained unchanged. After 24 hr. contact corrosion, the pits were observed to be more pronounced and the corrosion was noticed to be becoming deeper around the paraffined spots and at the solution line. The amber colored solution turned green. Further contact corrosion intensified the various characteristics observed after 24 hr.

#### Stainless 18-8:

A few pits were formed around the paraffin drops on the surface of the unprocessed material, after 6 hr. contact corrosion. These pits became more marked, and a slight solution line began to form after 24 hr. The solution turned from amber to green. There was no marked increase in the pitting or the solution line corrosion after 48 hr., but, after 72 hr., the pitting and corrosion increased. The solution remained green throughout the tests, that is after the first 24 hr.

#### Colored 6 Per Cent Chrome:

At the end of 6 hr. no effect was observed in either the surface of the specimen or the amber colored solution. These conditions remained unchanged for 72 hr., at which time a few small pits were observed to form in the processed material. However, there were no changes at the solution line or around the paraffin drops throughout the entire duration of the experiment. After 100 hr., a few more pits were observed to form, but no chemical reaction was observed to take place between the acid and the specimens, since the amber color of the solution remained unchanged.

#### Colored 18 Per Cent Chrome:

No change occurred after 6 hr. in either the surface or the color of the solution. The specimens and solutions were not affected by contact corrosion at the 72-hr. mark; only after 100 hr. were a few pits observed along the solution line of the specimens. The color of the solution did not change—it remained amber.

#### Colored 18-8 Stainless:

The specimen and solution remained unchanged for 72 hr. After 100 hr.

(CONCLUDED ON PAGE 79)



# Remedies for Furnace Brazing Ailments

By H. M. WEBBER

Industrial Department, General Electric Co., Schenectady, N. Y.

**A**RMED with fundamental, practical knowledge the user or prospective user of electric-furnace brazing should encounter few difficulties that cannot readily be remedied, states Mr. Webber. To facilitate trouble-shooting, however, he here gives a condensed summary of data presented in the 10 previous articles of his series. These articles, listed separately at the end of this final installment, form a veritable text-book of practical working value to engineers and production executives who use or contemplate use of the process.

**T**HE art of electric-furnace brazing is relatively simple, and is easy to use in production. The rules to follow are common-sense rules. The user can incorporate successfully his own ideas into the design or re-design of a product to be furnace brazed without having had previous experience, if he makes a reasonable effort

to acquaint himself with the possibilities and the limitations of the process.

This series of articles has been prepared so that the user and prospective user will have available an outline of the fundamentals of electric-furnace brazing. With an understanding of these fundamentals it is believed that he will be equipped to put the average job into production with little difficulty.

Occasionally, in the development of a new product an unexpected and undesired result is obtained which might be overcome easily if the reason is sought. Or, sometimes a change in materials or processing of parts in the production line is responsible for a certain difficulty arising in the furnace-brazing department. Following is a condensed summary of information contained in the preceding chapters, designed to give practical hints on what to try or where to look for possible remedies for furnace-brazing ailments:

## A Summary of What to Look for and What to Try If Things Go Wrong

	Issue 1938	Page	Col- umn	Figure No.
<b>A</b> —If the brazing metal doesn't creep through the joint, even though it melts and forms a fillet at the top side,				
<b>TRY:</b>				
1.—More time in the furnace	Nov. 3	35	1	—
	Dec. 8	48	3	—
	Dec. 29	31	2, 3	71
2.—Higher temperature	Nov. 3	35	1	—
	Dec. 8	49	1, 2	—
3.—Less tightness of fit—try size-to-size or even slightly loose fit	Sept. 15	32	1	—
	Dec. 29	30	2, 3	70
	Dec. 29	31	1	70
4.—Flux application to both brazing metal and parent metal within and around the joint	Nov. 3	33	2	50E
	Nov. 3	35	1	—
	Nov. 24	33	3	—
	Dec. 8	48	2, 3	—
	Dec. 8	49	1, 2, 3	—
	Dec. 8	50	1, 2	—
5.—Thorough cleansing of parts before assembly—remove all lubricants, dirt, oxides, etc.	Nov. 3	34	3	—
	Nov. 3	35	1	—
	Dec. 8	50	2	—

	Issue 1938	Page	Col- umn	Figure No.
<b>LOOK FOR:</b>				
6.—Interruption of capillarity within the joint, such as by a gap	Nov. 3	31	2, 3	48
7.—Line contact within the joint instead of uniform tightness throughout the joint	Nov. 3	31	3	49
8.—Freezing of the brazing metal caused by pickup of the parent metal	Nov. 3	32	3	50A
<b>B</b> —If the brazing metal draws or "balls up" on surfaces after melting, without wetting, instead of spreading out and creeping into the joint,				
<b>TRY:</b>				
1.—Increasing the rate of flow of gas to the furnace atmosphere	Nov. 3	33	1	50C
	Nov. 3	33	2, 3	50E
2.—Greater hydrogen content in the furnace atmosphere	Nov. 3	33	3	50E
	Nov. 10	44	3	—

	Issue 1938	Page	Col- umn	Figure No.
3.—Raising the furnace doors the minimum height. Keep them closed as much as possible to keep air out .....	Nov. 3	33	1	50C
	Nov. 3	33	2, 3	50E
4.—Flux on surfaces .....	(Same as A4)			
5.—Roughened surfaces, produced by shot blasting, pickling, etc. ....	Nov. 3	32	1, 2	50B
	Nov. 3	33	1	50B
	Nov. 3	34	1, 2, 3	51, 52
6.—Removing surface skin, by machining or grinding cold-drawn or cold-rolled materials such as bar stock .....	Nov. 3	34	3	—
7.—Washing parts to make surfaces chemically clean .....	Nov. 3	34	3	—
	Dec. 8	50	2	—
8.—Pickling parts to remove surface oxides .....	Nov. 3	32	1	—
	Nov. 3	34	2, 3	52
9.—Setting the assembly up in a different position, such as on an incline, to encourage brazing metal to run down into joints .....	Sept. 15	31	3	17
	Sept. 22	49	2, 3	42, 43
10.—Plating with copper, if brazing metal is copper, to prevent selective oxidation of such elements as chromium if contained in parent metal .....	Sept. 15	31	1	15
LOOK FOR:				
11.—Impurities in acid used for pickling, grit used for shot blasting, lubricant used for grinding, etc. ....	Nov. 3	34	3	—
	Nov. 3	35	1	—
12.—Drafts in room which blow air into furnace. Erect screens or hoods to deflect such drafts. ....	Nov. 3	33	1	50C
	Nov. 3	33	3	50E
<b>C</b> —If the brazing metal flows away from the joint instead of being drawn into the joint, even though it wets the surfaces,				
TRY:				
1.—Providing a reservoir at the joint into which the brazing metal can flow .....	Nov. 24	29	1, 2	55, 56
	Nov. 24	31	3	65
2.—89				
3.—Placing the brazing metal in a strategic position above the joint if axis is vertical, or against the shoulder if axis is horizontal, so it will creep into the joint. ....	Sept. 15	30	2, 3	—
	Nov. 24	28	2, 3	54
4.—Daubing copper-powder paste at the joint, if brazing metal is copper, in addition to the regular supply of copper .....	Nov. 24	32	3	—
	Nov. 24	33	1	—
5.—A light plating of copper on surfaces, if brazing metal is copper .....	Nov. 24	31	3	—
LOOK FOR:				
6.—Turned-up burrs, such as at edges of punched holes, or other obstacles, over which the brazing metal might not creep .....	Nov. 10	44	2, 3	—
<b>D</b> —If a low-melting brazing alloy melts but retains its original form,				

such as the form of wire, without flowing,

#### TRY:

- 1.—Thoroughly coating the brazing metal with flux before using. .... (Same as A4)
- 2.—Mechanically or chemically cleaning the brazing metal, if noticeably oxidized, before using. Dec. 8 50 2 —

**E**—If the joint opens up during the furnace-brazing treatment, although it was tight beforehand,

#### LOOK FOR:

- 1.—A too-heavy press fit, which stretches outer member beyond its elastic limit .....
- 2.—Unequal expansion of parts, due to unlike metals or sections. ....
- 3.—Relief of cold-worked stresses in certain parts .....
- 4.—An unsupported section which might sag at high temperatures. ....

**F**—If the joint leaks after furnace brazing, even though it appears to be well filled with brazing metal,

#### BE SURE THAT:

- 1.—The joint is snug and tight before furnace brazing, if copper is the brazing metal. Provide intimate contact throughout joint with no gap .....

#### LOOK FOR:

- 2.—E1
- 3.—E2
- 4.—E3
- 5.—E4
- 6.—Porosity in parent metal caused by burning through it when tack welding parts together.

#### TRY:

- 7.—A5
- 8.—Using a gap of 0.001-0.003 in. in the joint, with a generous supply of flux within and around the joint, if a low-melting alloy is employed .....

**G**—If the joint is weak after furnace brazing, even though it is filled with brazing metal,

#### LOOK FOR:

- 1.—Too much gap in beginning. ....
- 2.—E1
- 3.—E2
- 4.—E3
- 5.—E4

	Issue 1938	Page	Col- umn	Figure No.
6.—Impurities within the joint, such as heavy oil or a lead-bearing lubricant	Nov. 3	34	3	—
	Nov. 3	35	1	—
	Dec. 8	50	2	—
7.—Insufficient time in the heating chamber	Nov. 3	35	1	—
	Dec. 8	48	3	—
	Dec. 29	31	2, 3	71
8.—Insufficient temperature.	Nov. 3	35	1	—
9.—Drastic treatment after brazing, such as heating in cyanide and quenching in water	Dec. 29	31	3	73
	Dec. 29	32	1, 2	73
10.—Relative movement of parts while the brazing metal is solidifying which will generally weaken the bonds.				

**H**—If the work comes from the cooling chamber discolored, and it is desired to have it bright,

**LOOK FOR:**

**I**—Discoloration of steel surfaces but bright copper-coated surfaces, which indicates too low ratio of hydrogen to water vapor, or of carbon monoxide to carbon dioxide, or both, in the atmosphere in the cooling chamber.

**CHECK:**

a.—Performance of surface cooler on furnace-atmosphere controller. Clean the condensing tubes if needed, or take other steps to reduce moisture content of gas.

**CHECK:**

b.—Performance of furnace-atmosphere controller to see that maximum hydrogen and carbon monoxide is being produced, consistent with good operating practice.

**SEE THAT:**

c.—Water flow in furnace cooling chamber is slow enough to cause no condensation of moisture in liner of cooling chamber.

**LOOK FOR:**

2.—Discoloration of both steel and copper-coated surfaces, which indicates the presence of free oxygen in the cooling chamber. (Also see J below).

**TRY:**

a.—Increasing the rate of flow of gas.

**LOOK FOR:**

b.—Drafts in the room which blow air into the heating or cooling chamber.

Issue 1938	Page	Col- umn	Figure No.
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**TRY TO:**

- 1.—Eliminate drafts at their source.
- 2.—Adjust flow of gas to the heating and cooling chambers, if possible, so as to counteract the drafts.
- 3.—Set up screens or hoods at the ends of furnace to block drafts.

**LOOK FOR:**

c.—Leaks in gaskets or seals in furnace. Consult furnace builder for instructions for testing for leaks.

**J**—If the work emerges from the cooling chamber bright, but discolors when it strikes the air, caused by the parts being too hot,

**TRY:**

- 1.—Increasing the flow of water through the furnace-cooling chamber.
- 2.—Slowing down the rate of travel of the work.
- 3.—Diminishing the heat developed by the flame curtain at the discharge end if there is such a curtain.
- 4.—Diminishing heat on outgoing work caused by combustion of the atmosphere gas, by raising discharge door and allowing idle flame to burn back in throat, or lower the door and extinguish flame entirely if necessary.

**CHECK:**

5.—The furnace-cooling chamber for presence of mud or scale in the water jacket. Clean out if necessary.

o o o

[This series by Mr. Webber began in *THE IRON AGE* of Sept. 8, 1938. The titles of the various articles and the issues in which they appeared are as follows: Electric Furnace Brazing: Where and Why to Use It, Sept. 8, 1938; Holding and Supporting Assemblies in Electric-Furnace Brazing, Sept. 15 and 22; Capillary Attraction and Wetting Action Explained, Nov. 3; Limiting Creep of Furnace-Brazing Metals (With Data on Removing Copper After Brazing), Nov. 10; Applying Electric-Furnace Brazing Metals, Nov. 24; Selecting Furnace-Brazing Metals (With Notes on Venting Hollow Bodies), Dec. 8; High Strength of Furnace-Brazed Joints Explained, Dec. 29; Furnace-Brazing of Cast Iron (With Notes on Causes of Distortion of Furnace-Brazed Assemblies), Feb. 2, 1939; and Factors Affecting Selection of Furnace-Brazing Equipment, March 16.]

## Liquid Prevents Decarburization During Heat Treatment

**A** LIQUID, Sel-Car, is being sold by the National Copper Paint Corp., 1760 Diversey Parkway, Chicago, for the protection of the surfaces of steel susceptible to decarburization during heat treatment. It is also highly recommended for air hardening die forming steel, and to prevent carbon penetration in defined areas of low carbon steel during heat treatment.

For best results, the surface of the steel to be treated should be free from grease, oil, rust or scale. Grease, oil, rust and scale can be removed by placing the pieces of steel to be treated into a furnace and then bringing the temperature up to approximately 600 deg. F. for a period of 20 min. Adhering to these simple rules will produce positive results. A standard de-greaser is also efficient.

SEL-CAR may be applied by brushing or dipping. When brushing, it should be applied with a reasonably soft brush to insure uniform coverage. In dipping, one coat is required.

For the protection of the surfaces of steel susceptible to

decarburization during heat treatment, one coat is usually sufficient.

For selective carburizing or prevention of case penetration, a one coat dip job or a two coat brush job is usually recommended. If the heat cycle exceeds 10 hr., an additional coat will assure the most satisfactory results.

Sel-Car is also recommended for camshafts, steering rod levers, pinions, spindles, piston pins, gears and numerous other steel products on which there are various soft and hard surfaces for drilling, riveting, milling, thread cutting, etc.

These surfaces are said to be so positively controlled by the use of Sel-Car that spotting areas can be positively pre-determined and the surfaces to be machined retain their original softness and ductility. The steel under the protective coating maintains an average of 40 points softer (Rockwell C) than the untreated surface.

Sel-Car for selective carburizing is recommended for such types of S.A.E. steel as 10-20, X13-14, 13-20, 23-15, 31-20 and 46-15.



# Role Played by Gas Reviewed at Cleveland



WENDELL E. WHIPP

president of the National Machine Tool Builders' Association was principal speaker at the Industrial Gas Sales Conference. C. E. Gallagher, president of East Ohio Gas Co. is on the left, and F. H. Trembly, Jr., of Philadelphia Gas Works Co. is on the right.

**K**EEPING abreast of heating requirements in varied modern industrial fields engrossed a two-day meeting of equipment and gas men March 27 and 28 at Cleveland, under auspices of the American Gas Association. With glances toward opportunities for development, the role played by present day equipment was thoroughly reviewed, and the technical lectures evoked considerable discussion.

Some of the complex problems of users were brought to the fore with accomplishments in recirculating air heating, luminous flame combustion, baking ovens and boilers. The attendance of 164 persons was the highest yet attained at such an industrial sales conference conducted by the Association.

Principal speaker from the outside was W. E. Whipp, president National Machine Tool Builders' Association,

By **DON JAMES**

*Cleveland Editor, The Iron Age*

• • •

and president, Monarch Machine Tool Co., who spoke at the Monday luncheon session. His message was reported in last week's issue of *THE IRON AGE*.

Recognition toward the necessity for eliminating CO<sub>2</sub> from partially burned fuel gas atmospheres, and the tendency toward atmosphere generators equipped to remove both moisture and CO<sub>2</sub>, were two trends cited by Bruce W. Gonser, supervising metallurgist on the staff of Battelle Memorial Institute, Columbus, who spoke at the Tuesday morning meeting on "The Present Status of Prepared Atmospheres in Industrial Heating."

Removal of nearly all the H<sub>2</sub> and CO as well as moisture and CO<sub>2</sub> by

closely controlling the combustion of the fuel gas used, is a sound trend toward building a desired protective gas, he continued. While low carbon steels are being satisfactorily treated by present partially burned fuel after moisture removal, charcoal generators are coming into more general use for treating medium and high carbon steels in this country.

In the purification of gas mixtures for the prevention of decarburization of steel, the first requirement for an atmosphere is freedom from oxygen, he said, and the next most undesirable impurity is water vapor, which can be avoided by refrigeration or the use of an activated dryer. Carbon-dioxide, next to be removed, may be removed by means of several absorbents. Sulphur must be overcome when treating copper base materials.

Dr. Gonser classified the means for  
(CONTINUED ON PAGE 113)

# New Devices for Plant Service

**N**OT readily classifiable in our regular weekly equipment reviews are the hundred and one items that service the metal working plant and its maintenance department and that contribute to good house-

keeping, worker comfort and safety. Some of the recent announcements of makers of this miscellaneous apparatus are reviewed in the accompanying article.

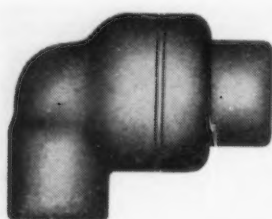
14 in. nominal size. They are applicable to a wide range of speed requirements, the timing of the stroke and power applied being readily modified in service. Open and closed applications and positioning control are available by automatic or manual means and by remote control.

**M**ULTI-POWER hydraulic power units for actuation of valves of any make are being manufactured by the *W. F. & John Barnes Co.*, Rockford, Ill., and are

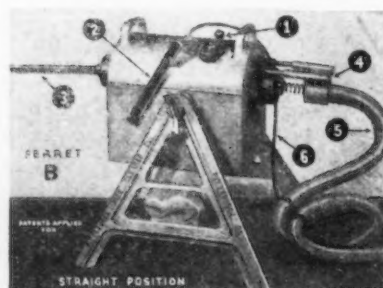
being marketed by *Automatic Temperature Control Co.*, Philadelphia. These actuators can be used for opening and closing operations on globe, gate, butterfly and rotary plug valves from 4 to



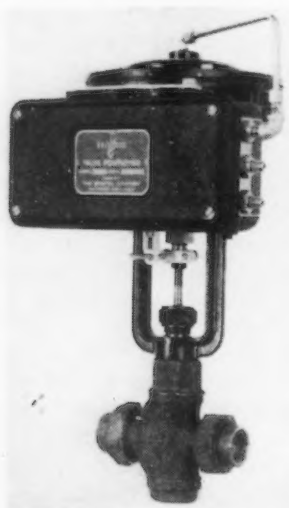
**E**XPLOSION, weather or water proof motors can be used to drive the gear pump in the Barnes hydraulic actuators for valves of any type.



**CHIKSAN** ball bearing swing joints are now furnished for  $\frac{3}{8}$  and  $\frac{1}{2}$ -in. standard pipe connections.



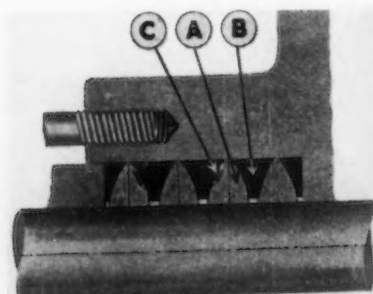
**T**HE Pittsburgh Pipe Cleaner Co., 223 Oliver Building, Pittsburgh, has developed two motor driven Ferrets for opening and cleaning pipes of all kinds, including heating and cooling coils. To accomplish this, helically coiled cable is fed into the pipe in 15-ft. lengths and spun by means of a clutch. Other lengths are added by means of a special coupling. The rapid rotation of the cable scours the line and clears up obstructions. Cutting tools, brushes and special drills are also available for cutting out obstinate obstructions. Model B, shown, takes cable sizes from  $\frac{1}{2}$  to 1 in. and operates on pipe from  $\frac{3}{4}$  to 8 in. Model A is used on  $\frac{3}{8}$  to 2 in. pipe.



**F**RICITION is overcome on the valve stem of this Bristol diaphragm controlled valve positioner so that sensitive response is assured.



**T**WO men can work at the model C Beaver pipe and bolt threader without interference. Built-in motor and chuck drive pipe up to 2-in. nominal size.



**T**WO metal rings (A), convex on one side and flat on the other are used as the sealing medium on the shaft in a new type of rod packing for severe duty made by the Rodpak Mfg. Co., San Francisco. These rings are ordinarily made of babbitt metal, but other alloys are used for high temperature service (up to 700 deg. F.). Between the metal rings are rings of neoprene (B) which are concave on both faces so as to mate with the convex faces of the metal rings. These rings do not touch the rod. Beryllium copper springs (C) are embedded in the synthetic rubber rings and seat themselves in recesses in the metal rings. On rotating shafts they prevent the packing from turning with the rod, and on reciprocating shafts they exert an inward and downward pressure so as to offset any irregularity of the rod.

# and Worker Safety

By FRANK J. OLIVER

Associate Editor, *The Iron Age*

The design is compact. It employs a motor driven Barnes gear pump and circuit developing 1000 lb. per sq. in. but with built-in relief features that minimize heating of the fluid. The design of the hydraulic actuator is said to preclude the common hammer blow generally required to lift a valve from its seat, thereby assuring longer life to the entire structure. Emergency

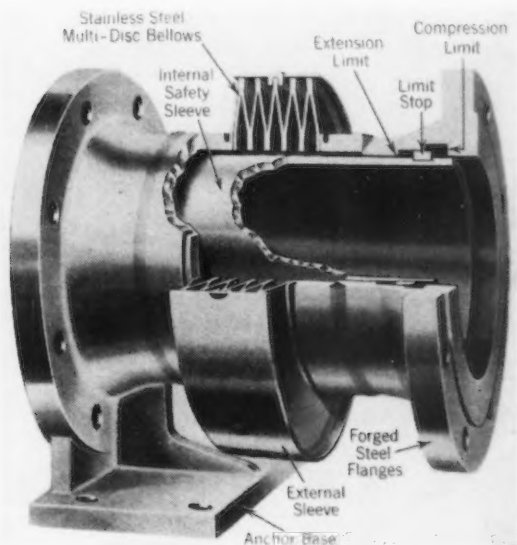
hand operation is provided, also locking in either the open or the closed position.

## Valve Positioner

THE Bristol Co., Waterbury, Conn., announces the development of a new valve positioner for use on diaphragm control valves to overcome the effect of friction in the valve stem and top. This pneumatic

device is recommended for use on all air-operated control installations where close control is paramount and particularly where there is considerable process lag.

This valve positioner is said to assure a proportionate valve stem travel for even the slightest change in the pressure of the air from the controller. Any friction that might tend to prevent the valve disk from coming to its intended position in order to main-



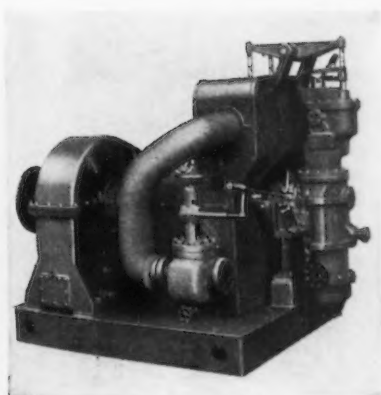
## AT LEFT

THIS all-welded, all-steel type S packless expansion joint with flexible element consisting of a stainless steel bellows is a new product of the Foster Wheeler Corp., 165 Broadway, New York. Materials other than the bellows are forged and rolled steel fabricated under the Sta-Norm electric welding process. The joints are made in standard pressure series of 50, 150 and 300 lb. per sq. in. and from 2 to 36 in. nominal pipe size. Regular construction is good for temperatures to 750 deg. F. Special joints can be had for higher temperatures and for 600-lb. pressure.



## ABOVE

RATED at 50-ton capacity, this Rochester hydraulic jack is only 6 in. high and has a lift of 2 3/4 in. In operation, the extended barrel is screwed in until the hardened plunger contacts the work. Then the long screw with stud end is turned to lift the object. Made by Rochester Machine Co., 126 Virginia Avenue, Rochester, Pa.



## ABOVE

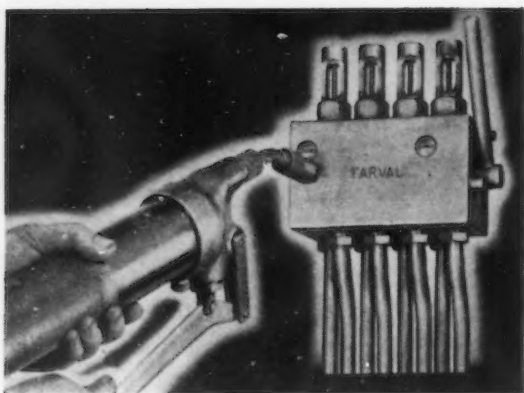
TYPICAL Westinghouse type M steam turbine for general purpose drive. Sizes range from 100 to 2000 hp. with steam conditions up to 650 lb. at 750 deg. F. Modifications of one basic design provide for condensing, condensing extraction, non-condensing, non-condensing extraction or mixed pressure service. They are particularly suited to driving pumps, compressors, fans and other process machinery.

## AT RIGHT

TWO 50-ton Duff-Norton air motored jacks with rubber tires shown at work moving a drop forge hammer base.



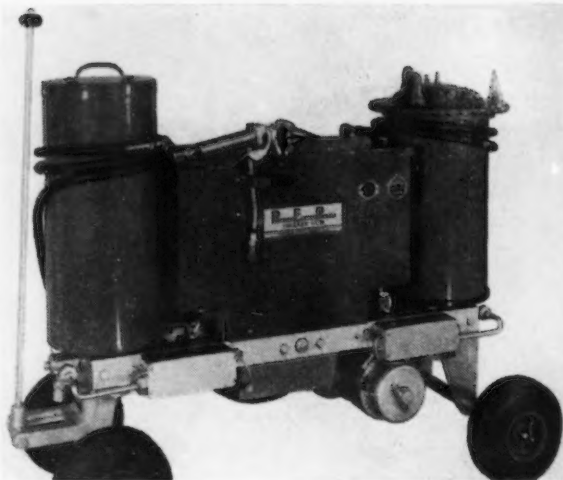




AT LEFT  
FROM two to eight grease feed outlets per block are available in this new Farval unit with single inlet port and multiple measuring valves in pairs.

o o o

AT RIGHT  
MODEL D-39 Pressurelube Scooter is a fully portable storage battery powered greasing unit with two containers, one for ordinary greases, the other for fibrous and other viscous lubricants. Line pressure is up to 12,000 lb. per sq. in.



tain close control is completely overcome.

### Ball Bearing Swing Joints

FOR operations that require small leak-proof and pressure-tight swing joints, *Chiksan Oil Tool Co., Ltd.*, Fullerton, Cal., is introducing small units in  $\frac{3}{8}$  and  $\frac{1}{2}$ -in. pipe sizes. Like the larger sizes made by this firm (up to 12 in.), these new units incorporate double rows of hardened steel balls which carry both the radial and thrust load and which keep a constant pre-load on the packing element. There is no adjustment in service, and no further greasing is required under ordinary conditions.

High pressure joints are of steel construction, tested to 4000 lb. per sq. in.; low pressure joints are of brass or malleable iron, tested to 300 lb. These joints can be used for fluids, gases, or steam. Five styles are made for

various rotating motions to give the required degree of flexibility.

### Pipe Tools

TO supplement its power adapter for driving hand pipe threading tools, *Beaver Pipe Tools, Inc.*, Warren, Ohio, has developed the model C portable pipe and bolt machine, incorporating a built-in  $\frac{1}{2}$ -hp. Black & Decker universal motor. The unit, designed for either bench or stand use, will thread pipe up to and including 2 in. with solid dies at a speed of about 22 r.p.m. It will thread bolts



FOR industrial cleaning purposes two companies have recently introduced two-speed portable blowers of identical capacity. Upper illustration shows the Air-master made by Skilaw, Inc., Chicago, while the lower view shows the model HP Cadillac blower made by Clements Mfg. Co., 6650 S. Narragansett Avenue, Chicago. At the high speed, capacity is 176 $\frac{1}{2}$  cu. ft. per min.; air speed 26,000 f.p.m.; static pressure, 49 in. of water. At the low speed, capacity is 125 cu. ft.; velocity, 20,500 f.p.m. and pressure 36 in. The low speed is available where full power might destroy delicate machine adjustments. Both types can be used for cleaning by suction or for spraying paints, lacquers or deodorants.

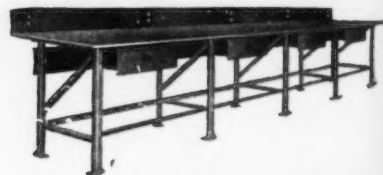
up to  $1\frac{1}{2}$  in., and through a power take-off will operate geared tools to thread pipe up to 8 in. A conventional geared type scroll chuck is used to hold and drive the work while the pipe tool torque is taken against an adjustable arm.

Gears are fully enclosed and power loss is minimized through the use of ball and roller bearings in the train. Main driving gear runs in a bath of oil.

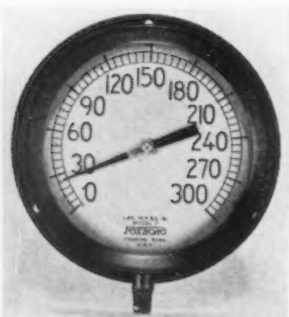
### Portable Grease Lubricator

A NEW type of portable grease lubricator which was first introduced in automotive service stations in the South, is now being marketed for industrial use by *Pressurelube, Inc.*, 22 East 40th Street, New York. Chief feature of the Pressurelube Scooters is the fact that they use a standard 19-plate Prestolite storage battery for power, with the gun pump driven by a Northeast starting motor such as used in trucks. Pressures up to 12,000 lb. per sq. in. can be attained for handling such viscous fibrous greases as Marfak No. 3. A General Electric Tungar rectifier is incorporated in the unit for recharging the battery off an a.c. power line.

Pump plunger and bushing is made



TO meet the demand for a shop bench with a heavy duty top, *Pollard Brothers Mfg. Co.*, 5500 Northwest Highway, Chicago, has placed on the market a line of benches with tops made of  $\frac{3}{4}$ -in. steel plate instead of the standard  $\frac{1}{4}$ -in. top. Made in widths of 24 and 30 in., the benches are available in lengths of 3, 4, 5 and 6 ft. The 6-ft. length has three heavy duty bench legs; the others, two. Accessories are made proportionally heavier also.

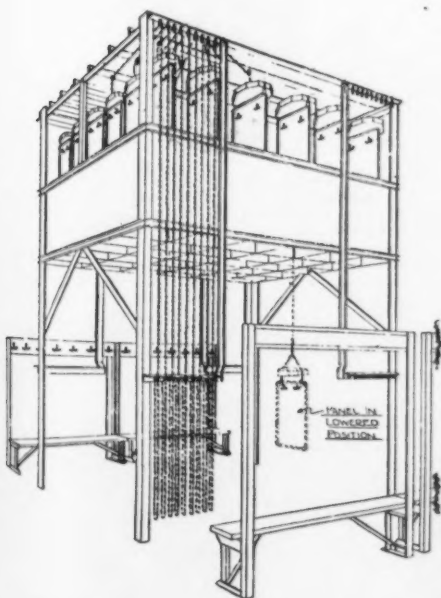


CHROME molybdenum steel is used in the bourdon spring in this all-welded steel model P pressure gage, offered by the Foxboro Co., Foxboro, Mass. A special Chapmanized steel is employed in the pinion, segment, arbor and connecting link. Segments and pinions have milled teeth. Many other parts, including the pointers and dials are of stainless steel. Model P test gage is available in ranges from 0 to 15 lbs. up to 0 to 10,000 lb., guaranteed accurate within  $\frac{1}{2}$  per cent. Model P hydraulic gage, in ranges up to 600 and 1000 lb., is guaranteed accurate within 1 per cent at any point on the range.



**MARKAL**, a solidified paint in stick form, is supplied in two types, one for cold marking, the other for hot marking, such as on the strip stock shown. The latter is suitable for temperatures from 200 to 1800 deg. F. and it is claimed that the material will not run, char nor discolor, nor will it peel off or crack when the material cools. Acid pickling baths will not disturb the marking. Comes in black, white, yellow, green, red and blue in packages of 36 sticks, with hardwood holder. Markal sticks for cold work come in the same colors, in packages of 12, with metal holder. A product of the Markal Co., 6 E. Lake Street, Chicago.

of Nitralloy steel; cam is of Meehanite metal and the scotch yoke of high grade cast iron. Chassis is made of electrically welded steel channels and is mounted on pneumatic-tired wheels. Hose is tested to 26,000 lb. Three



**THIS** overhead locker system for storing workers' clothing up out of the way in free air consists of a superstructure of steel that supports locker cubicles. Each locker unit, suspended by chain and pulls, consists of a hot pan 2½ in. deep and underneath it a clothes panel with hooks on either side. Chains may be padlocked to superstructure for privacy. Fusible links are provided at three points of each locker unit so that it drops the unit to the floor in case of fire. This system, made by Lyon Metal Products, Inc., Aurora, Ill., comes in single and double faced units, giving sets of 18 or 36 lockers each.

models are available: single container of the standard type, single container designed for fibrous lubricant and a two-container model, illustrated.

#### Grease Distributing System

**A** NEW system for lubricating small machines or a few bearings on larger machines from a single grease inlet has been developed by the *Farval Corp.* of Cleveland. It consists of a multiple measuring valve block having from two to eight outlets and a single inlet port, to which a conventional hand or power type grease gun is connected. In one position of the valve handle on the side, lubricant pressure moves the valve pistons and delivers grease to one set



**D**ECREASE in cost of repairing cement factory floors by the Flexrock cellulose process has been made possible by the addition to the patching material of Montmorillonite, composed of manganese, silica, alumina and iron. Besides increasing the coverage capacity per pound, this addition makes Ruggedwear resurfacer easier to mix with cement, sand and stone, also increasing the toughness needed for featheredge repair work. The material is sold by the Flexrock Co., 2301 Manning Street, Philadelphia.

of outlets. The valve handle is then thrown manually to effect lubrication of the other set. Tell-tale indicators inform the operator which bearings have received a shot of grease. The amount of lubricant delivered to any pair of outlets is individually adjustable.

#### Burst Proof Steam Hose

**A**N improved burst-proof steam hose for saturated steam pressures up to 200 lb. per sq. in. or superheated steam up to 390 deg. F. has been introduced by the *B. F. Goodrich Co.*, Akron, Ohio. On sizes 1¼ in. and larger, one ply of asbestos woven fabric and a spiral reinforcement wire are placed between the wire braids. Use of the spiral reinforcement prevents to a marked degree collapse or kinking when the hose is flexed or moved by means of a sling. On 1-in. sizes and under, a braided asbestos fabric is used without the additional

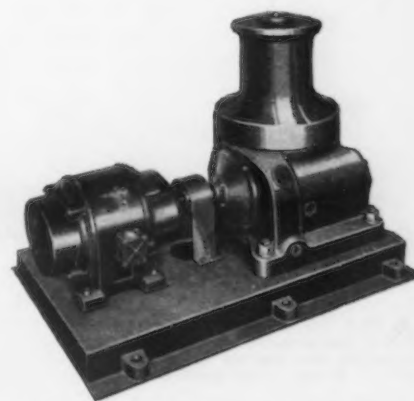


**MADE** of Alcoa 51 S.I. alloy with tensile strength of 48,000 lb. per sq. in., this compact riveted aluminum utility ladder weighs only 5½ lb. Platform is 7¼ by 12 in. and both platform and step are corrugated to prevent slipping. Bottom has rubber feet. Height enables average person to reach a shelf 8 ft. from the floor. Made by Aluminum Ladder Co., 130 Fifth Avenue, Tarentum, Pa.

reinforcing. Size range is from ¾ to 2½ in.

#### Rust Preventer for Steam Mains

**E**LIMINATION of rust, scale, corrosion and congestion in high and low pressure steam lines through atomization of a special eradicating fluid introduced by means of a feeding device called the Mogul pressure jet is announced by the *North American Fibre Products Co.*, Keith Build-



**L**INK-BELT CO., Chicago, has added to its line two vertical capstan electric car spotters employing a high torque motor of the buyer's choice connected to the spotter drive mechanism by an enclosed roller chain coupling and mounted with the spotter on a welded steel base. Identical in capacity with the Nos. 5 and 10 units of more compact design with flange mounted motors, the Nos. 5A and 10A spotters are powered with 5 and 10-hp. motors, respectively, with 5000 and 10,000 lb. cable pull to handle up to three and six cars. The vertical capstan machine finished to prolong the life of the haulage cable, is made of semi-steel or cast steel.



**A**NOTHER new Link-Belt product is a mechanical vibrating screen for the removal of solids from factory waste water. One of the trial applications of this screen, which uses fine-mesh stainless steel screen cloth, was at a steel mill where slag light enough to float into the stream adjoining the mill's quench pit was eliminated. The motor of 1 or 2 hp., depending on the screen size (2 x 4 ft. or 4 x 5 ft.), is mounted on top of the screen's steel framework. The mechanical vibratory action of the screen is said to be sufficient to remove the particles from the cloth, no spray water being necessary.

ing, Cleveland. The equipment consists of a housing containing a copper coil through which the treating material is atomized and injected into the steam mains. Only two connections are required. It is said that the equipment and materials are very effective in removing incrustation without interrupting steam service and in speeding up the transmission of steam heat for process work.

The same company also makes a colloidal boiler scale remover, sold under the trade-name, Mogul Ever Clean boiler process.

#### Air Hose

**A**SPECIAL feature of the newly designed U. S. Super Royal Cord air hose for severe service conditions such as are encountered in mining and

in oil refineries, is the use of a high grade synthetic rubber tube, with a tan gum cover. Both the cover and the tube are well bonded to the hose body, which is of cord tire construction as heretofore. The hose is said to be lighter and more flexible, but many times stronger than actually required. This is a product of the



**IMPROVED** baffle type nozzles, providing a non-turbulent distribution of gas from carbon dioxide fire extinguishing systems, have been introduced by the C-O-Two Fire Equipment Co., 560 Belmont Avenue, Newark, N. J. These nozzles reduce the velocity and pressure of the discharge and permit expansion and non-violent penetration of the gas throughout the entire protected area.

*Mechanical Goods Division, United States Rubber Products, Inc.*

#### Finish for Concrete Floors

**A**PPPLICATION of synthetic resins to the finishing of concrete floors is announced by the Master Builders Co., 7016 Euclid Avenue, Cleveland. Durability under traffic wear four to six times that of standard

floor paints is claimed for Glazecoat, which is available in 12 deep clear colors. Glazecoat stain, which is first applied to the floor, has a covering capacity of approximately 500 sq. ft. per gal., and the finish Glazecoat has a capacity of 1000 sq. ft. per gal. It dries in about ½ hr. and is then polished. Prior to application of the stain, the cement is etched with a 10 per cent solution of muriatic acid, after being thoroughly cleaned.

#### Face Shields

**T**HREE new face shields for light duty protection have just been announced by the American Optical Co., Southbridge, Mass. Although not designed to replace goggle protection, these face shields are suitable for light duty work on operations such as metal hand sawing, sanding, buffing, and light grinding.

Compactness and light weight make these shields comfortable to wear, and



**THROUGH** the new dispenser shown, International Salt Co., Inc., Scranton, Pa., provides a handy way for workers on hot jobs or who sweat profusely in hot weather to get their necessary ration of salt. Experience shows that workmen in hot jobs who take a 10-grain Sterling salt tablet with every drink of water do not get heat cramps from "heat sickness." The top of the dispenser unscrews for refilling. The tablets themselves come in a carton containing approximately 1000 tablets.



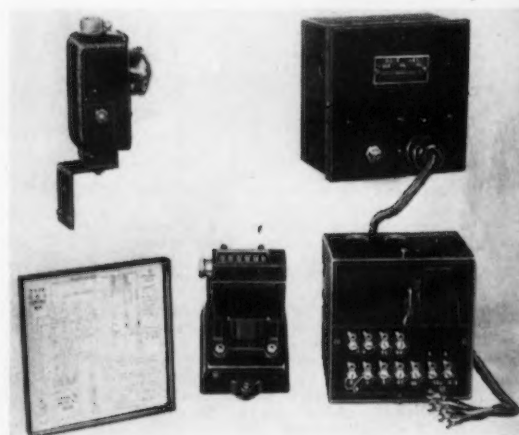
ABOVE

**A**NEW line of strip heaters for operation at sheath temperatures as high as 1200 deg. F. has been announced by General Electric. These heaters are enclosed in porcelain enameled steel casings in place of the usual alloy steel sheaths for high temperature service. Besides being lower in cost, the porcelain enameled units offer greater resistance to corrosion.

o o o

AT RIGHT

**T**YPE PC-3 high speed photoelectric counting equipment, made by the Lipman Engineering Co., 415 Braam Street, Pittsburgh, is capable of 600 counts per min. It is supplied complete with photoelectric amplifier and contact relay unit, light source with adjustable bracket, power supply control box and counter in four or six digit models. Polarized plugs are used for connections. Estimated tube life is 7000 to 10,000 hr.







**F**OR guarding faces of workers in light grinding operations, woodworking, spot welding and similar hazards, Willson Products, Inc., 264 Thorn Street, Reading, Pa., is offering the type SW Protecto-Shield, made of thick, transparent cellulose acetate extending well back along the sides of the face. It is held on the head by a molded rubber headband with a knitted fabric sweat pad in contact with the forehead. Shield may be had in clear, amber or green cellulose.

they may be thrown up when not in use. The windows are made of a durable, transparent material, measure 4 x 9 in. An aluminum binding strip

gives them rigidity to prevent warping, yet permits shaping them to accommodate large features. The shields may be worn with or without prescription glasses and are supplied in clear, amber, or green windows.

**A** SIMILAR type of face shield made by Willson Products, Inc., of Reading, Pa., is illustrated.

#### Inhalator

**A** NEW inhalator for resuscitation work is being marketed by the Davis Emergency Equipment Co., 55 Van Dam Street, New York, so designed that it can be used with oxygen tanks of three capacities without the need of special adapters. For ordinary emergency work, two 16-cu. ft. cylinders containing a mixture of oxygen and carbon dioxide are carried in the inhalator case. If additional supply is needed, a 50-cu. ft. tank can be connected to the pressure reducing valve, or finally the valve can be attached directly to a standard 220-cu. ft. tank. The breathing bag, pressure reducing valve and cylinders can be removed from the case and the bag



**A** NOTHER Willson safety device and one especially designed for plating operations, brazing, paint spraying and other operations involving light concentrations of organic vapors and acid gases is a new low-resistance chemical cartridge respirator. It is available in either 190 or 100 cc. content. The respirator has a form fitting rubber facepiece and is compact enough to be worn under a welder's helmet without interference. Three chemical refills are available, depending upon the use to which the respirator is put.

placed close to patient. A supplemental face piece allows two victims to be treated at the same time.

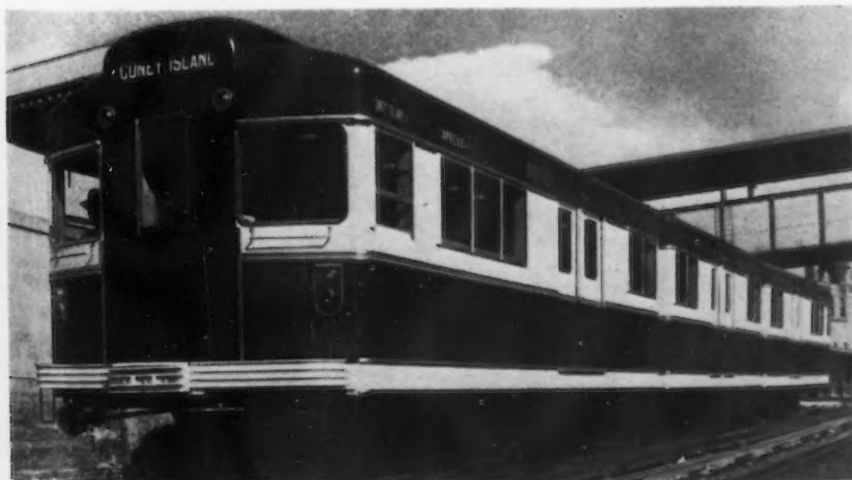
## New Type Subway Car Built of Aluminum

**A** NEW type of subway car (see illustration) was placed in service on March 23 by the Brooklyn-Manhattan Transit Co., New York. It is built of aluminum shapes, equipped with safety glass windows and plate glass mirrors. The body

of the car is cushioned on rubber, the first time this has been successfully accomplished, it is said, in car construction. Precision extrusion of aluminum shapes and use of the new Huck rivet made possible a body structure heretofore impractical. This

rivet, which was developed by the Clark Equipment Co., Buchanan, Mich., which built the car, is placed without hammering and can be installed with extreme rapidity when only one side of the work can be approached. It consists of a soft steel sleeve banded about a harder shaft. The soft steel is squeezed into place, forming a strong bond without heating or hammering. It has been dubbed the "squeeze rivet" because of the method in which it is placed in position.

The light weight metal used in the construction of car has saved about one-third of the weight as compared with cars now in use. The aluminum shapes were furnished by the Aluminum Co. of America, Pittsburgh, and the rubber for the rubber "sandwich" between body and trucks and conical rubber springs was furnished by the B. F. Goodrich Co., Akron, Ohio. Other companies which collaborated in the construction of the car are the General Electric Co. and the Westinghouse Electric & Mfg. Co.



**THIRD** of a series of articles dealing with "The Right Metal in the Right Place," the objective being to aid manufacturers in selecting the most suitable non-ferrous metal or alloy for their products.

## High Purity Zinc



**AT LEFT—** A modern development in metal products manufacturing based on high-purity zinc. These three extremely thin-section zinc alloy die castings used as a bicycle head housing are dramatic testimony of the competition with complex stampings. Die casting permits sturdy bosses for rapid and accurate assembly. Photo by New Jersey Zinc Co.

**AT RIGHT—** Heavily coated, hot dipped, galvanized iron which stands severe deformation—a striking improvement in hot galvanizing. This is a piece of Armco Zincgrip during fabrication of a refrigerator pan.

**T**HE zinc of today is a thoroughly modern metal. It is produced as a high-purity material (up to 99.99) and its intrinsic physical properties are greatly enhanced by alloying with small percentages of other metals.

More than half of the zinc produced is consumed in the galvanizing or hot dip coating of iron and steel, because of its ability to protect iron from rust by preferential corrosion. Its next largest field is as a constituent

of brass. These are followed in volume by die castings and rolled zinc.

In all of these forms the use of zinc is so well known as to be standard practice. There is at this time no evidence of any important changes in the metal itself, but marked changes are taking place in the manner of its use, along the following lines:

- (1) Wider interest in special high-grade zinc.
- (2) The use of heavier zinc coatings.
- (3) The use of electrodeposited coatings.

Special high-grade zinc already has one tremendous accomplishment to its

credit. Next to the metallurgical development of the Zamak zinc die casting alloys, the introduction of special high-grade zinc for these alloys represents to date the greatest single contribution to the art. As a result, the die casting industry has almost revolutionized metal products manufacture. Until the use of special high-grade zinc became standard practice, die castings were considered unreliable by many. Now they are uniform in properties, permanent in shape (no "growing" or warping) and manufacturing practice is so improved that die castings are limited in size only by the capacities of the casting machines. They can be cast with walls

<sup>1</sup> "Electrolytic Zinc Methods Applied to Galvanizing," by U. C. Tainton. Journal of the American Zinc Institute, Vol. 18, 1937, p. 56.

<sup>2</sup> "The Use of Pure Zinc in Galvanizing," by John J. Enlow. Journal of the American Zinc Institute, Vol. 18, 1937, pp. 83-88.

# *a Modern Metal*

*By* **ADOLPH BREGMAN**  
*Consulting Engineer, New York*

so thin that the process competes with sheet metal stamping.

Although die casting is its largest single consumer (88,000 tons in 1937), special high-grade zinc has properties that recommend it for additional uses.

Special high-grade zinc has more recently begun to impress both producers and users as a suitable material for quality galvanized iron. Galvanizers are interested because of lower dross production, less chemicals

by the use of alloy additions in the zinc bath.

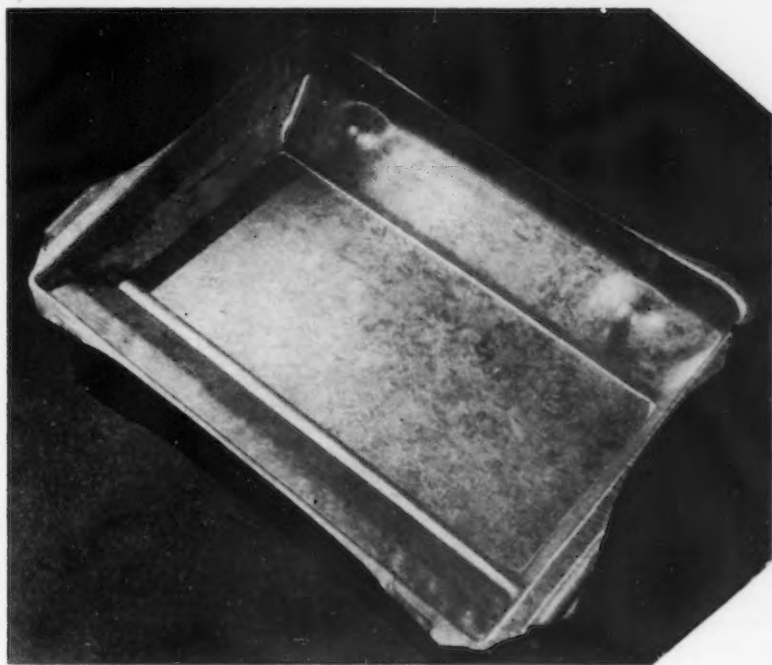
The ultimate consumers have been much impressed by the long life of heavily zinc coated sheets. Enlow<sup>2</sup> has reported that "Council Standard" galvanized sheets, carrying 1¾ oz. coatings, selling even at a premium price, have continued to sell well to farmers throughout the depression in Canada. Examples are mentioned of galvanized sheets which have been in use on buildings for 20 to 30 years. These sheets always carry heavy coatings.

The fact that heavier zinc coats afford better and longer protection is firmly established. The problem in hot dip galvanizing has been to produce heavy coatings that will stand severe deformation. The zinc-iron alloy formed next to the iron in hot dipping is more brittle than the iron or the surface zinc, and cracks during cold working. But in this respect also, important progress has been made. Heavily galvanized iron sheets are now being commercially produced for severe deformation without flaking or cracking. In order to secure ductile heavy coatings, the use of high purity metal is valuable.

Electro-galvanizing is one of the most promising branches of the industry today. From the user's standpoint, electrodeposited zinc has certain inherent advantages over zinc deposited by other methods. For practical purposes the zinc and iron do not alloy; consequently no brittle products are formed and the coating will take forming as well as the base metal. The thickness of the coat can be well controlled and much heavier coatings deposited than are at present obtainable by hot dipping, even up to 3.5 oz. per sq. ft. on wire for special purposes. (This is equivalent to 7 oz. per sq. ft. on sheet.) Conduits, strip steel and screen cloth are also being electro-galvanized with moderate coatings.

High-purity zinc appears not only as the output of electro-galvanizing

(CONCLUDED ON PAGE 80)



Advantage may be taken of its ductility to produce a foil in high yields. At the same time the material has sufficient strength to be used in lighter gages than the present available foils. Tainton<sup>1</sup> has reported that zinc, electrodeposited to a thickness of 3 oz. per sq. ft. on round wire (the equivalent of 6 oz. per sq. ft. on sheet—three times the "Seal of Quality" coating), will stand being wrapped around its own diameter without cracking the coating. Also, that sheet coated with 2 oz. per sq. ft. on each side (the equivalent of a 4 oz. coating) can be bent flat on itself and then restraightened without the sign of a crack.

consumed and fewer rejections or seconds. One producer<sup>2</sup> has reported dross as low as 25 lb., sal-ammoniac consumption of 7 to 10 lb., and 70 to 80 lb., of sulphuric acid used per ton of sheets galvanized. Seconds from every cause ran only between 2 and 3 per cent of total production, and in one lot of 4070 sheets of 14 gage for railway car roofing, the seconds totaled only about ½ per cent.

Of course there are problems, primarily associated with pan temperatures, pan construction and fluxes, but these problems are gradually being solved. The sheets are likely to have smaller and more irregular spangles, but the appearance can be improved



# Self-Locking Features Common to New Screw Fasteners

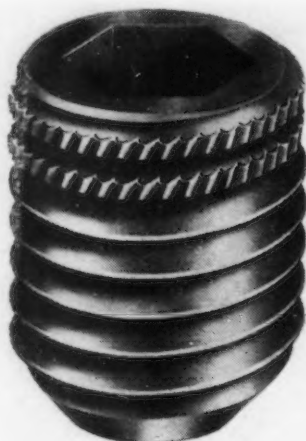
**A** NEW relieved screw thread profile has been patented by the Dardelet Thread-lock Corp., 55 Liberty Street, New York. Like the original Dardelet thread, this is a self-locking type, combining in the unlocked position a free-spinning nut of Class 2 fit having the increased range of thread tolerances for manufacturing purposes.

The root of the screw thread is stepped at the midpoint and each step is tapered 6 deg. with the axis of the screw. The lower step is undercut 0.003 to 0.005 in., depending upon the thread size, but the tapered crest of the nut thread remains as in the original design. Initial wrenching effort immediately produces a bolt tension because the clearance provided by the relief feature permits only line contact on the locking surfaces of bolt and nut threads at this stage of assembly. Further wrenching effort gradually forces the nut thread upward along the tapered slope of the bolt thread, proportionately increasing the area of the locking surfaces in contact. Finally, with the abutting thread flanks in contact, additional wrenching will develop the required bolt load while maintaining the lock. The locking

stresses are developed by the thread roots and are approximately at right angles to the bolt tension, thereby making the lock independent of bolt tension or vibration.

## Self-Locking Hollow Set Screw

The Standard Pressed Steel Co., Jenkintown, Pa., has added a self-locking feature to its "Unbrako" hollow set screws by knurling the two top threads. This knurling raises sharp prongs that dig into the threads of the tapped hole when the set screw is tightened. To do this, the set screw



**S**ERRATIONS on the two upper threads of this "Unbrako" hollow set screw add a self-locking feature.

must be flush with or slightly below the surface. This self-locking set screw works equally well in steel, cast iron, bronze and brass. It is said that the knurled portion will not damage the tapped hole, and although backing off causes the prongs to wear, it is possible to back off the screws several times before the locking qualities are lost.

## Thread Cutting Screws

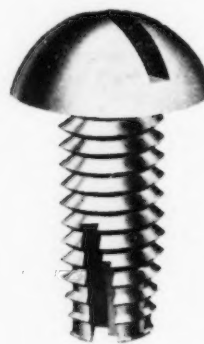
The use of self-tapping screws has become increasingly popular in recent years in the aircraft, automotive and similar industries because of their saving in time and self-locking features. The Shakeproof Lock Washer Co., 2501 North Keeler Avenue, Chicago, is offering a new type having a patented spring action slot and a special

hardening process. The slot is cut longitudinally at an angle, and the yielding section of the screw springs inward as turning is started, thus permitting the serrated cutting edge to have free access to the material being



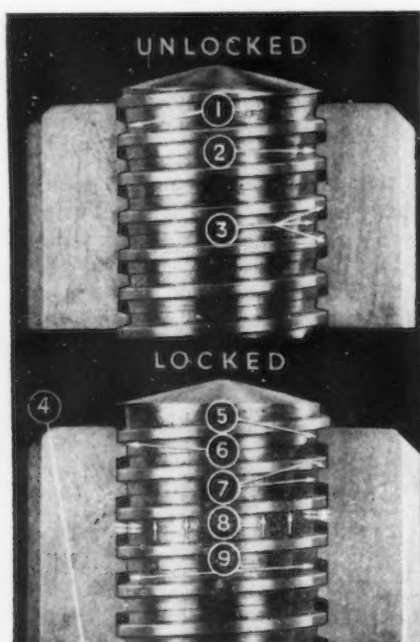
**BELOW**

**THIS** Shakeproof Hi-Hook thread-cutting screw is provided with a double width slot for cutting plastic compositions. A screw with a standard slot is also available for use in metals.



**ABOVE**

**SHAKEPROOF SEMS** is a pre-assembled lock washer and screw that saves time in assembly operations.

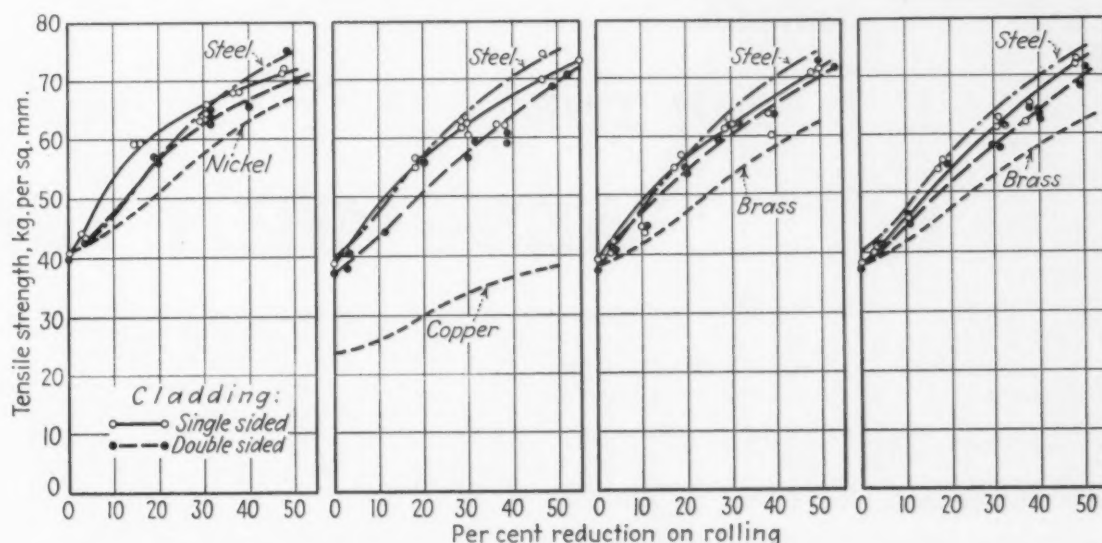


**T**HE new Dardelet self-locking screw thread profile has a relieved screw thread profile (1) stepped at the midpoint to give a free spinning nut in the unlocked position.

threaded. The chips removed in the cutting operation are directed into the slot away from the cutting edge, thus eliminating the possibility of clogging. Should the original screw be lost, a standard machine screw of the same size will fit its threads. Shakeproof thread-cutting screws can be supplied with standard round or flat slotted heads or in a variety of special heads and in sizes up to 1/2 in.

Shakeproof has also designed a so-called Hi-Hook thread cutting screw with a double width slot for cutting a clean, sharp thread in plastic compositions, both molded and laminated. The construction is said to materially reduce the high driving torque normally encountered and to reduce breakage of the plastic to a minimum.

Another Shakeproof development is called SEMS—a pre-assembled lock washer and standard machine screw. The lock washer will remain on the screw, regardless of how it is handled, so that it is possible to use this fastener in a screw driving machine with automatic hopper feed.



**TENSILE** strength of cold rolled clad bars plotted against per cent reduction, as compared with unclad material. From left to right: 3 per cent nickel-clad steel; 5 per cent copper-clad steel; 5 per cent brass-clad steel; and 7.5 per cent brass-clad steel.

## Rolling Properties of Clad Steels

**A** REPORT of the Kaiser-Wilhelm Institut für Eisenforschung, by A. POMP and G. WEDDIGE, describes the results of cold rolling trials on steel strip (0.17 C, trace Si, 0.51 Mn, 0.022 P and 0.040 S) with a tensile value of approximately 57,120 lb. per sq. in., which was clad on either one or both sides with various thicknesses of nickel, copper and brass. The effect of the cladding on the rolling properties of the steel was examined particularly. The total thickness of the test bars was 2 mm., their width 30 mm. and their length 600 mm. Strips of the unclad material and of the cladding metals of similar dimensions were also tested. The strips were heat treated and had perfectly clean surfaces.

The test bars were marked at an interval of 200 mm. and the initial thickness of 2 mm. reduced to 1.9, 1.8, 1.6, 1.4, 1.2 and 1 mm. in one pass by cold-rolling, equivalent to a reduction of 5, 10, 20, 30, 40 and 50 per cent respectively. Higher reductions could not be obtained as the bars slipped between the rolls, being lubricated with rape oil before rolling; the bearing pressures during rolling were recorded. After rolling, the thickness, width, and distance between the marks as well as the forward slip-indicating

marks were carefully measured. As the reduction increased, difficulties arose owing to the slipping and sticking of the strip bars, particularly in the case of the copper-clad strips and sometime also with the nickel-clad.

The results of these tests indicated that with all claddings the single-clad steel exhibited a higher, and the double-clad steels a lower, resistance to deformation than the plain-steel strips. The principal reason for this appears to be the frictional conditions obtaining in the gap between the rolls. The differences in the coefficients of friction between the strips and the top roll as compared with those between the strips and the bottom roll with single-clad strips produce an increase in friction between the rolls as well as in internal friction. On the other hand, with double-clad strips the friction between the rolls is diminished.

Considerable differences were observed in the forward slip between the various types of cladding, especially between the unclad steel and the clad steels. Steel strip clad with nickel on one side only exhibited a much greater forward slip than pure nickel and about double that found with the unclad steel, while the forward slip in the case of strip clad with nickel on both sides was less than that of the

unclad steel. Steel strip clad with copper on one side only showed about three times the forward slip with the unclad steel, while the strip clad with copper on both sides had double the forward slip. The strip with a single surface clad with brass had three times the forward slip of the unclad steel, and that clad with brass on both sides a value about 20 to 30 per cent above that of the unclad steel.

The forward slip was measured separately on both sides of the rolled strips, but even with the single-clad steels no difference was found between the clad and unclad steels. No clear difference in the increase in width between single and double-clad steels was found with any cladding. There is also little difference between the clad materials, the plain steel and the cladding metals.

The tensile values of the clad strips varied considerably, although they indicate that cladding reduces the tensile strength, in fact usually to a greater extent than corresponds to the lower tensile strength of the cladding metals, as shown in the accompanying graphs. The elongation at failure of the clad steels is determined by the steel base itself, and with all types of cladding was nearly the same as for the unclad steel.

# THIS WEEK

## ON THE

By W. F. SHERMAN  
Detroit Editor

# ASSEMBLY LINE

*. . . April auto schedules revised downward following decrease in the last week of March . . . Sales softening blamed for industry's hesitation . . . Spring weather expected to bolster retail selling efforts . . . UAW factions unable to weld organization together again.*

**D**ETROIT—What the automobile industry needs this spring is sunshine, and lots of it, to bring out the green leaves, flowers and customers in greater quantity. This statement is made without any attempt to treat lightly a subject that is of pressing importance to the industry today. A marked hesitation, which has had a serious effect on production schedules of the automobile

companies and on delivery schedules of their suppliers, is attributed by most observers to the gray skies and rainy days that reduce the incentive for large numbers of people to go out and buy automobiles.

Last week there was a very abrupt and unexpected change in production schedules which lowered output to 85,980 passenger cars and trucks from 89,400 the previous week, according

to Ward's Automotive Reports. A temporary setback of this nature would not be very serious, similar recessions having occurred in previous years at the same time. In 1937, production throughout March and April was quite erratic, varying between 97,710 and 127,755—twice during a seven-week period approaching the high point and twice approaching the low point (in this connection the chart published with the Assembly Line on March 23 will reveal the fluctuation clearly). However, the major companies have definitely reduced April schedules below those for March. This is serious.

Some observers prefer to hold the view that last week's drop in output, amounting only to 3420 units, is insignificant and represents merely a slight seasonal hesitation, or an attempt to

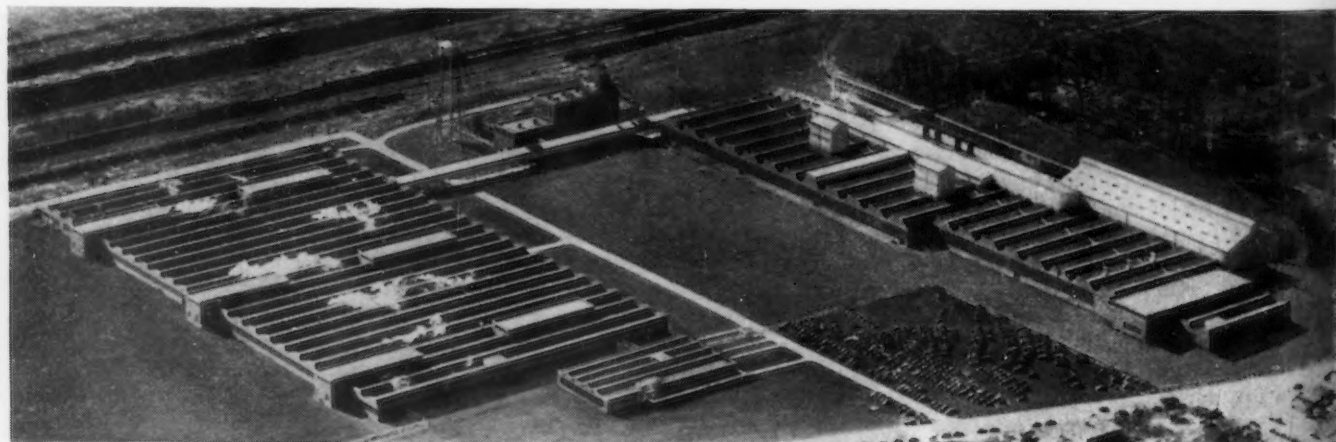
## International Harvester Co.'s New Truck Engine Plant

**A**IRPLANE view of complete new motor truck engine works of the International Harvester Co. at Indianapolis.

In the left foreground is the truck engine manufacturing unit. To the

right is the plant foundry, and in the rear is the power house. The vacant space between the foundry and the truck engine manufacturing unit is for possible future expansion of the foundry building, while the truck engine

manufacturing building can be expanded in the future to the left of the existing unit. Approximately 1500 men are now employed at the plant and the number is expected to be increased materially when the foundry gets into full operation.





# Specialists



## Small Tools and Gages

**N**ow, more than ever before, industry realizes the economic benefits of precision. Modern mechanisms must assemble from interchangeable parts if they are to be produced economically and function properly. That means accuracy from one end of the shop to the other.

Precision parts are not difficult if you use precision cutting tools and gages. Any old tools will *not* do. Once you set the job up with accurately built cutters and reamers and taps and dies, and with the proper gages to govern the results, your parts will be right. That is why so many shops have standardized on the accurate performance of Pratt & Whitney small tools and gages.

We are specialists in producing these tools. The answer is design . . . material . . . heat-treatment.

All of our steels are purchased to definite chemical specifications. To meet our high standards they must pass rigid tests in both the physical testing and the well-equipped chemical laboratories. With electrical control of both time and temperature in our hardening room, metallurgy is an exact science at Pratt & Whitney.

We are proud of our facilities that make such fine products possible. Won't you visit our plant in Hartford and see for yourself how we do it?

**Pratt & Whitney**

Division Niles-Bement Pond Co.

Hartford, Conn., U. S. A.

THE IRON AGE, April 6, 1939—61



**I**NTernational HARVESTER executives, spending \$12,000,000 on plant modernization and expansion, looked over the A.S.T.E. exhibition in Detroit recently for new ideas. Here they are shown discussing a new method of producing starter ring gears by broaching and shaving. Left to right: B. F. Bush, Colonial Broach Co.; Hugo A. Weisbrodt, assistant superintendent, International Harvester; Charles R. Staub, chief engineer, Michigan Tool Co., and C. M. Harrison, general superintendent of International.

balance inventories at the end of March. Most published reports follow this line of thought.

#### Parts Shipments Delayed

However unpleasant, there is another view that must be considered. Throughout this area, suppliers who are shipping parts to automobile companies received wires on Friday delaying and, in some cases, canceling shipment of parts. Oldsmobile and Buick, for instance, held up shipment of parts representing 10,000 cars, without explanation, and with no definite date set for future shipment. Other G. M. units such as Pontiac and Cadillac, and most Chrysler units, were represented in the telegrams or telephoned notices that were received. It was also learned that in the last few days of the week there were meetings in automobile plants to determine production schedules in April (these meetings are usual at the end of the month) and after the meetings it was announced that one day each week would be trimmed from the working schedule. This means that plants that recently got on the five-day week, for the first time in months, will return to three or four days a week. Others which have just got on the three or four-day schedule will drop back one day also. Besides the reduction in the working week, many plants are laying off men in sub-assembly departments, telling them that the lay-off is for two or three weeks.

Only Ford production last week approximated the production of the week before, the ratio being 22,230 units to 22,290 units. Chrysler divisions turned out 20,375, against 20,825 the previous week, and General Motors, 33,260 against 34,984. The important reductions in output probably will be felt this week. Production for April, which has been estimated at about 400,000 cars and trucks, is now estimated at only 350,000 units, or 32,000 lower than March, just concluded. Normally, April is the peak month of the year.

#### Retrenchment Sudden

The suddenness of the retrenchment in production left the industry's spokesmen without a ready explanation. Unanimously they said that the weather played a prominent part in softening sales during the last 20 days of March. They also pointed to the weakness in stock markets and current reports from Europe as playing a prominent part in buyers' decisions. It is known that retail sales reports for the second 10 days of March showed continued gains over the pre-

#### THE BULL OF THE WOODS

BY J. R. WILLIAMS



vious 10-day period, but the rate of gain seems to have slowed slightly. Sales figures for the last 10 days of March are not yet available, although individual companies have their own records regarding them. Executives decline to comment on the sales of the last 10 days.

The latest registration figures available are those from R. L. Polk & Co. covering the first 14 days of March. They indicate that the month's total registrations would exceed those for February by about 40 per cent when the records are complete.

Meanwhile the level of industrial employment in Detroit, as shown by the index of the Detroit Board of Commerce, remained at approximately 100. Since most of General Motors production of parts and cars is outside the metropolitan district, only Chrysler and Ford Detroit production is reflected in the employment index.

#### Watching Retail Sales Closely

Investigation at half a dozen different points indicated that the delays in shipment of parts, and delays in production schedules, were for two weeks. It is probable that retail sales will be watched very closely during this period to determine whether the spring "pick-up" has arrived or not. It is probable that resumption of heavier schedules on April 17 will depend entirely on the retail sales record of the next two weeks.

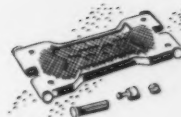
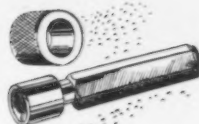
The interest of industrial buyers continues to be lax, and in view of events of the last week no quickening of interest is expected. About 10 days ago Fisher Body made one of its rare buys, this one being for a fill-in on its steel requirements. It was a matter of only a few thousand tons, allocated among several suppliers.

#### Labor War Not Settled

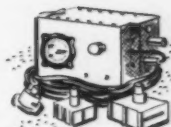
Considerable interest has been focused on Cleveland during the last week while the CIO-UAW held its convention. Question of greatest interest was whether the CIO would be able to whip the UAW into shape and make a unified organization out of it. However, reports reaching Detroit indicated that factionalism played havoc with all plans. The convention has made more clearly evident the fact that there are not two factions in the UAW, but three or four major ones, and many minor ones. With everyone attempting to be general, not even Sidney Hillman, CIO vice-president, could maneuver the delegates into an early settlement of a program and an early election of new officers.

Presidential aspirations of three or four prominent union leaders led to  
(CONTINUED ON PAGE 82)

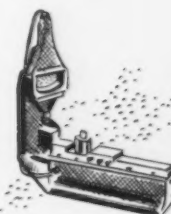
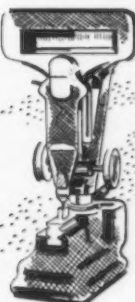
## DEVOTED TO THE VITAL SCIENCE OF MEASUREMENT SHEFFIELD GAGE CORPORATION



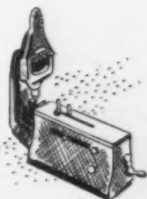
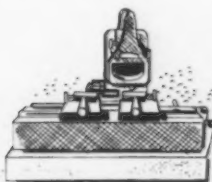
Exact measurement daily becomes more and more important to makers of all types of products. Ability to make and check measurements quickly—both on an engineering and production basis—is vital, particularly to builders of all types of interchangeable parts and products.



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# THIS WEEK IN WASHINGTON

*... TNEC may end before its steel inquiry is concluded  
... LaFollette offers "oppressive labor practice" bill ...  
Senate approves yearly expenditure of \$10,000,000 for  
strategic materials ... Norton measure would correct  
Wage-Hour law defects.*

By L. W. MOFFETT

Washington Editor, *The Iron Age*

WASHINGTON — With virtually complete returns received from small steel companies, larger producers now have begun to send replies to the first Department of Justice-Federal Trade Commission steel questionnaire sent out in connection with the Temporary National Economic Committee investigation.

This particular questionnaire deals with information on distribution and pricing of 10 major steel products for February, 1939, and was sent to 54 companies with 90 per cent of the country's ingot capacity. Later, a similar questionnaire covering a single month in 1937 and 1938 will be sent out, according to present plans. Comparison then can be made, it was explained, with shifts in distribution and mill net prices that replies received are said to indicate resulted from the elimination of price differentials in June, 1938. The Federal Trade Commission, in its blast before the TNEC, without the slightest factual matter at its disposal, glibly passed over this sweeping change in pricing policy. The commission, having prejudged the case, said in effect that elimination of differentials had no effect on competition in the steel industry. In addition to these two questionnaires, a third

has been sent out. It calls for data on distribution only covering 1936, 1937 and 1938.

## Search for Facts

While these are known as joint questionnaires because the inquiry of the steel industry was assigned to both the Department of Justice and the Federal Trade Commission, they are being handled only by the Department of Justice to which replies are being sent. This department will analyze and interpret the material for presentation before the TNEC as part of its steel study, submitting a separate and clearly a much more studied case than that made by the FTC. It is evident that whatever its conclusions, the Department of Justice has made an objective approach that has given weight to its efforts as contrasted with the heavily discounted "study" submitted by the FTC which not only consisted entirely of old matter but of the fixed conviction that steel should abandon the basing point system in favor of an f.o.b. mill system of quoting prices.

Even before the FTC submitted its case, there was wide criticism, not confined to the steel industry, that, because of its well known hostility toward it, the commission is not quali-

fied to participate in a study of the industry. The commission's exhibition has confirmed that opinion. For this reason, it is a source of increased interest that the Department of Justice, has made a constructive approach in the inquiry and will submit its work independently of the witch-hunting commission, which, it is understood, will be supplied only with results of the Department of Justice study.

## Steel to Answer

It is not known when the Department of Justice will begin the submission of testimony in the steel case, nor the complete character of the evidence, for it proposes to present material in addition to that gathered from questionnaires. After the department presents its case the steel industry will be given time to prepare its answer before its representatives appear before the committee.

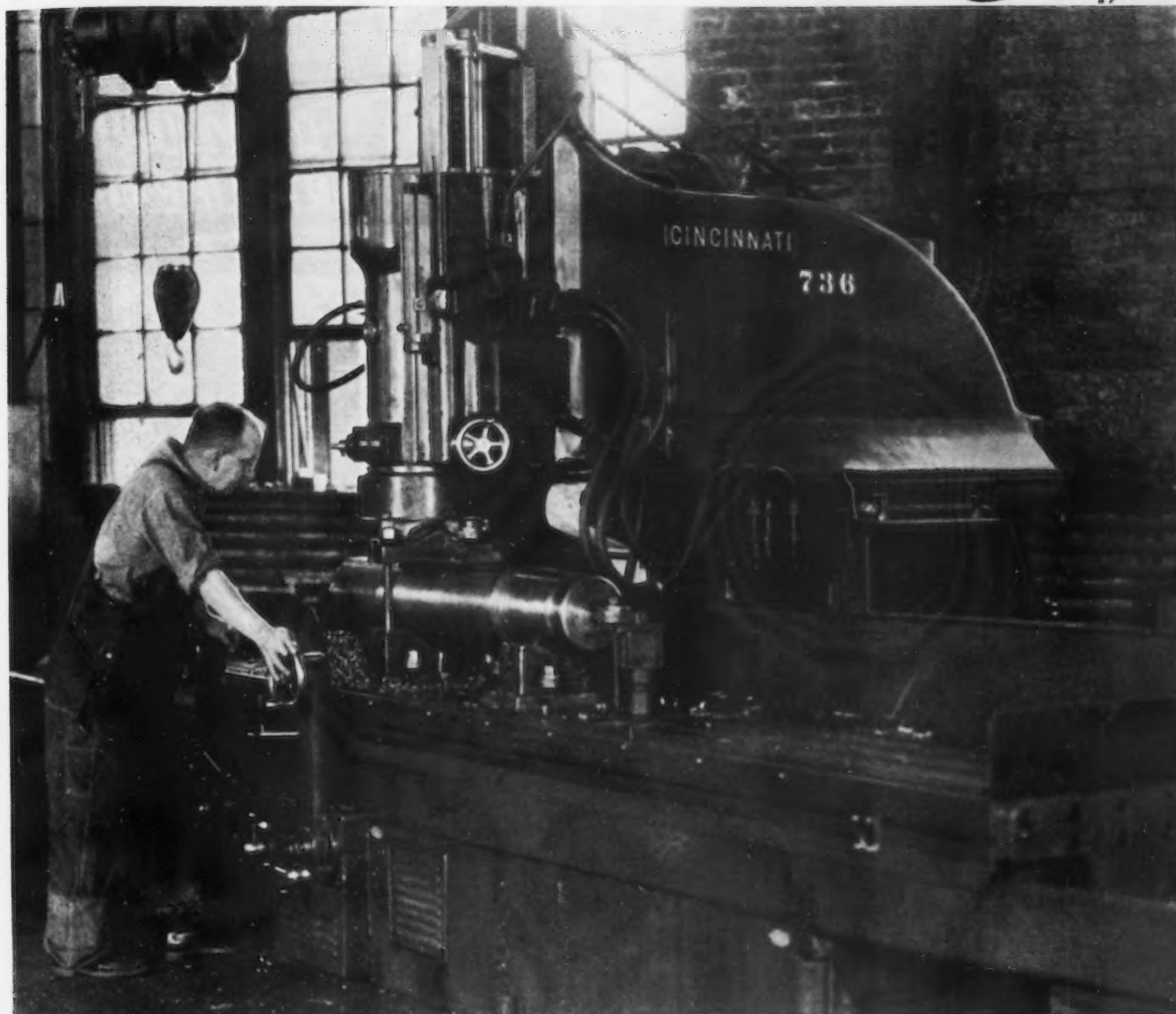
It is probable that it will be at least several weeks before the Department of Justice begins presentation of evidence in the steel industry and that the testimony will not be completed before fall. Indeed there is a question whether or not the entire case can be completed before the TNEC is brought to an end.

The public clearly never showed much interest in the TNEC. Its hearings largely have been drab and, ballyhoo of interested sponsors to the contrary, they have yielded but little material of either economic or legislative value. The belief still prevails that it was politically conceived as a witch hunt but largely was turned from this purpose when there was unfavorable reaction. Mostly it has been a rather mild quizzing bee and a sounding board for many and varied economic ideas, and, many think, a peg on which Senator O'Mahoney can hang another argument for his Federal licensing bill.

## TNEC May End

Congress, sensing the drift, lost interest in the TNEC and it now looks

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## FOR THE CINCINNATI HYDRO-TEL

Milling long round-end keyways in big husky shafts is no push-over for an ordinary milling machine. And when a square must be milled on the end of the shaft with a 12" face mill, taking cuts at the rated horsepower capacity, the job is just twice as tough. That's the kind of work this CINCINNATI Hydro-Tel Vertical Milling Machine is doing day in and day out.

The shafts range in size up to 12" diameter, and some of the keyways are as large as 2½" wide x 1¼"

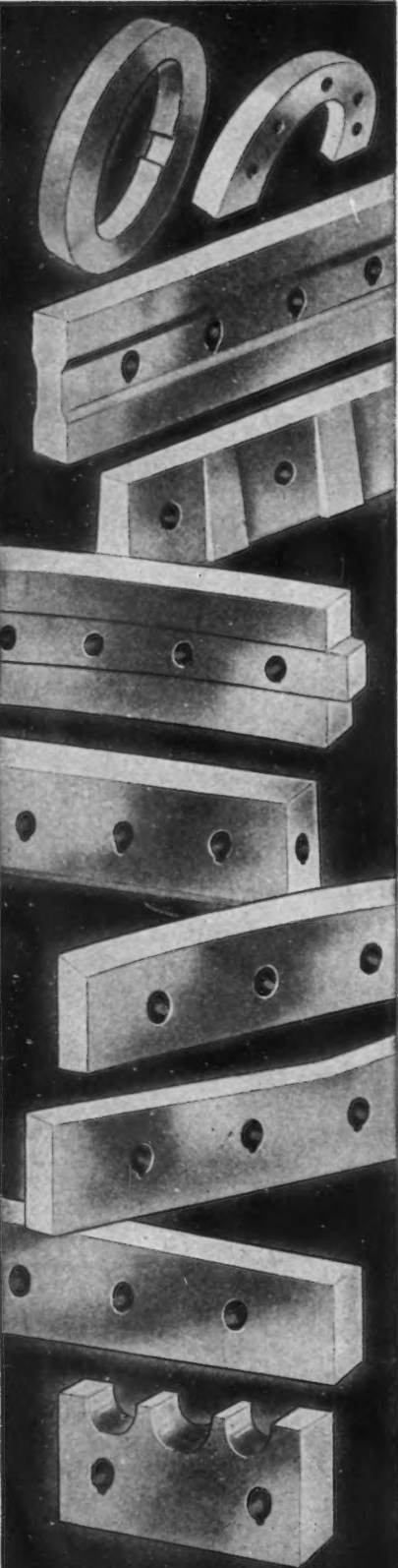
deep and 72" long. Savings over the former method average 18%.

A machine for this job has to be big and husky, and the CINCINNATI Hydro-Tel is just that. In addition to being built to take heavy cuts, the table and cross slide may be positioned to the accuracy required of die sinking work, and so easily that the operator can work the hand controls all day without tiring. Catalog M-796 tells the whole story. Write for a copy.



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as though it may force it, by the simple device of curtailing appropriations, to come to an end next January. Thus, it may be that steel will be one of the industries which will not get the complete "survey" that was originally intended, though it may or may not be the object of recommendations for legislation that the committee will make. Definitely, it is doubted seriously that there will be any recommendation to compel f.o.b. mill pricing as so strongly urged by the FTC.

Under the pretension of economy, the Senate Judiciary Committee has reported favorably on a bill providing \$600,000 to allow the TNEC to continue hearings. Hearings now are in abeyance, because the Committee has spent the original \$500,000 which it was given. The resolution setting up the committee contemplated that it should be given \$2,000,000 and conduct studies till January, 1941. Even this large sum was a "compromise" since Administration members of the committee had tried to wangle Congress for \$3,000,000 over and above the allotted \$500,000. Making the best of the situation, O'Mahoney said the proposed \$600,000 fund will be ample for the TNEC to conclude its present schedule and report to the Senate in January, 1940.

On Monday the Senate approved the appropriation. Senator King, Democrat of Utah, a member of the committee, said he was not opposed to the appropriation but expressed the opinion that the investigation would not "live up to expectations."

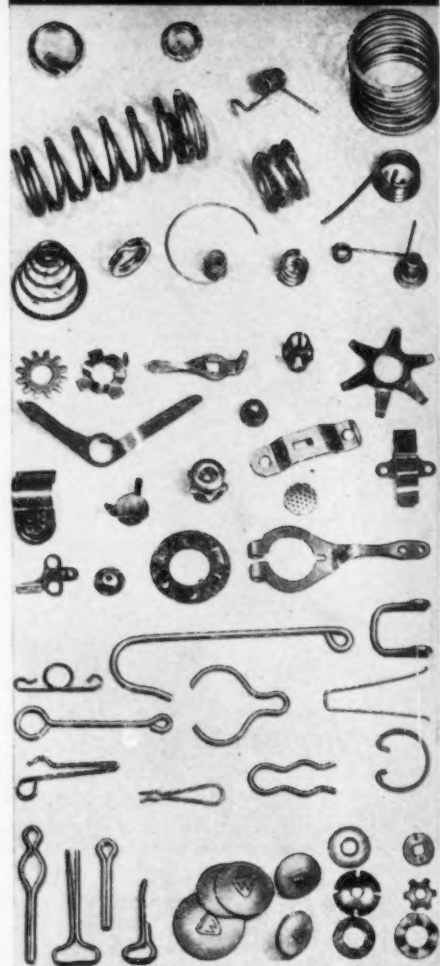
#### P.W.A.'s Share of 1933-38 Steel Purchases 4.72%

**W**ASHINGTON—Of the \$591,002,980 which the Bureau of Labor Statistics, Department of Labor, says was spent for iron and steel on PWA projects for the five-and-a-half-year period from June, 1933, to January, 1939, were included purchases of items of remanufactured steel products as well as two products, cast-iron pipe and stoves, which are made in foundries.

These items aggregate \$166,172,959, leaving \$424,830,021 which properly was spent for initial steel products. On the basis of this figure such purchases represented only 4.72 per cent of the estimated \$9,000,000,000 spent for steel during the five-and-a-half-year period.



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## LaFollette Offers Labor Measure

WASHINGTON — The LaFollette Civil Liberties Committee after almost three years of investigating industrial "espionage" and other "oppressive labor practices" at a cost of \$150,000 has reported to Congress what steps it feels should be taken to enact remedial legislation.

Embodied in a bill introduced in the Senate by Chairman LaFollette, the proposed legislation would prohibit the use of labor spies; the use of strikebreakers or strikebreaking agencies; the employment of private guards except for the protection of goods or money in transit; the employment of guards having criminal records; the possession of "industrial armaments" by plants involved in a strike.

Enforcement machinery would be handled by the Justice and Labor Departments and would be set up to ban the interstate shipment of goods produced in violation of the law. A suggested amendment to the Public Contracts Act would require prospective Government bidders to agree to abide by provisions of the law.

"In no way does the bill deprive the employer of the fullest protection of property," said Senator LaFollette and Chairman Thomas of the Senate Labor Committee in a joint statement for the press. "It does not touch his legitimate private protective equipment nor limit policing activities on his own premises."

Since the committee was established in June, 1936, it has spent \$150,000, held 98 days of public hearings, and examined 485 witnesses who contributed 18,000 words of testimony. Transcripts of hearings and exhibits have been printed in 26 volumes with eight more yet to be compiled. It has submitted six different reports to Congress and expects to turn in three more.

## Southwestern Scrap Tariff Suspended

WASHINGTON—The Interstate Commerce Commission has suspended from April 1 to Nov. 1 tariff schedules to establish loading rules on scrap iron and steel loaded in gondola cars for application on shipments in Southwestern territory. Unless according with proposed rules scrap would take class 22½ rating. The commission suspended the tariffs, pending investigation, because it said they would increase scrap rates.

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We have complete facilities for building locomotives. This view of the assembly floor at our Erie (Pa.) Works shows part of an order for ten 100-ton diesel-electrics for railroad use.



This new 20-ton diesel-electric is one of five now working in the quarries of a large cement company.

**S**IZES as small as 10 tons. Prices approximately the same as you pay for straight mechanical locomotives.

Here's what electric drive gives you: Smooth and constant application of power; accurate control; faster pick-up, which means more work in less time; ease of control, which keeps your operators alert.

Because of much lower operating cost, diesel-electrics pay for themselves in only a year or two. A G-E representative will analyze your haulage problem and determine how much these new diesel-electrics will save you. Write for Bulletin GEA-3071, General Electric, Schenectady, N. Y.

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If you have machining "problems" check your tool problem . . . the right ARMSTRONG TOOL HOLDER will handle its job efficiently for it will be correctly designed, correct in proportion, in cutting angle, approach, and, will permit maximum clearance all around. It will be strong beyond any need, will stand up for years of continuous service at any speed or cut the machine tool can attain. It will do the work of a complete set of forged tools and will "Save: All Forging, 70% grinding and 90% High Speed Steel" on every job.

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## February Industrial Machine Exports Off

WASHINGTON — February exports of industrial machinery were valued at \$20,752,959, or 12 per cent below the February, 1938, shipments valued at \$23,631,271, according to the Machinery Division of the Department of Commerce.

Valued at \$7,832,893, February exports of power-driven metal-working machinery were off 17 per cent below the comparable 1938 figure. Shipments were at lower levels in most items in this group. Increases consisted principally of vertical boring mills and chucking machines. These increased from \$190,190 in February, 1938, to \$290,461 in February, 1939. Milling machines exported increased from \$1,194,943 to \$1,596,305; planers and shapers from \$127,313 to \$254,959; and forging machinery and parts from \$356,247 to \$506,933.

Other reductions were on lathes which decreased from \$1,828,997 to \$1,447,698; thread cutting and automatic screw machines from \$513,032 to \$337,331; gear cutting machines from \$309,043 to \$283,964; drilling machines from \$511,859 to \$272,604; internal grinders from \$965,647 to \$180,510; sheet and plate metal-working machines from \$425,561 to \$327,637; rolling mill machinery and parts from \$788,020 to \$685,551; and foundry molding equipment from \$104,472 to \$47,820.

## Norton Bill Aimed At Wage-Hour Law Flaws

WASHINGTON — A bill designed to correct defects found by Administrator Elmer F. Andrews after six months experience under the Fair Labor Standards Act has been introduced in the House by Representative Mary T. Norton, Democrat of New Jersey, and chairman of the House Labor Committee.

Among other things the measure would specifically exempt from the minimum wage provision "white collar" workers receiving \$200 or more monthly; permit suits to restrain violations of the act to be brought in any district where the defendant is found or is inhabited, or where he transacted business; and revise the law to protect from liability all innocent persons handling goods produced in violation of the law.

Under the proposed revision, the Administrator would also be given broader powers to define the application of the law—a change which Mrs.

Norton said would make business "less jittery" about the law. Under the existing act the Administrator is unable, for example, to define technical and trade terms except where the law specifically gives him that power.

### N.E.M.A. Members Meet With Hopkins' Aides

WASHINGTON — Members of the electrical manufacturing industry, some of whom said they came to Washington with "their fingers crossed," announced last week after a two-day session with Commerce Department officials that the meetings had been worthwhile.

The conference, sponsored by the National Electrical Manufacturers Association to familiarize industry members with the department's facilities for assisting business men, was the first of its type to be held since Harry L. Hopkins was made Secretary of Commerce. Hopkins, who was vacationing with President Roosevelt, said in a message read to the conferees that the meeting represents "concrete evidence" that business and Government can work "hand in hand to implement a practical approach to business problems."

N. G. Symonds, vice-president of the Westinghouse Electric & Mfg. Co., Pittsburgh, said members of the industry came to Washington in a "stop, look and listen attitude" and were primarily interested in improving their markets.

If the results of the meetings are deemed satisfactory to Commerce Department officials, it is expected that similar sessions will be held for other industries. It is generally interpreted as a part of Secretary Hopkins' so-called business appeasement program.

### U. S. Supplies 66.12% of Italy's Scrap Imports

WASHINGTON—Italy imported 400,617 metric tons of iron ore during 1938, an increase of 92 per cent over the corresponding period of 1937 when imports totaled 208,607 metric tons, the Commerce Department reports. The United States was the principal supplier of iron and steel scrap in 1938 and supplied 66.12 per cent of total imports. During 1938 Italy imported 12.85 per cent more scrap than in 1937. The report said that scrap is the principal ferrous raw material imported into Italy.



## UNCHANGING -- BUT PROFITS NOT REQUIRED

All of us have frequently heard of the unchanging ruggedness of the "Old Man of the Mountain." The sight of his face is impressive but

Do you realize that many industrial plants today seem to be emulating the "Great Stone Face"? They have remained practically unchanged for years and have no particular intention of doing otherwise in the immediate future. As might be expected, they are continually wondering why profits cease any longer to make their appearance.

In other words, stability is carried much too far when it is applied to the machine



tools in use in many plants. Design changes have been so rapid that the manufacturer who expects to survive cannot afford to use yesterday's equipment.

For example, a large printing press manufacturer has just reported that a recently purchased Landis grinder will pay for itself in one year on the basis of full time operation. This organization is a very successful one. Do you think it would be equally so if its equipment were kept as unchanged as the "Old Man of the Mountain"? 295

LANDIS TOOL CO.  
WAYNESBORO, PENNA.

## INVEST IN LANDIS



1854 1939

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**18x7 Non-Rotating**

**6x19 Filler Wire**

**6x19 Seale**

**6x37 Extra Flexible**

**8x19 Extra Flexible**

## \$10,000,000 Yearly For Strategic Materials

WASHINGTON—The War Department would spend \$10,000,000 a year for the next four fiscal years for purchase of strategic and critical materials as a wartime reserve under a bill passed last week by the Senate. A total expenditure of \$102,000,000 over a four-year period provided for in the Thomas bill and specifically requested by the War Department was turned down by a vote of 33 to 31.

The House Military Affairs Committee had recommended the full \$100,000,000 authorization with restrictions to be placed on the amount to be spent each year by limiting actual appropriations. The House committee put its stamp of approval on an ultimate stock pile of 554,000 gross tons of manganese ore; 250,000 gross tons of chrome ore; 3350 tons of tungsten ore; and 85,000 tons of tin.

A strategic material, as defined by Senator John E. Miller, Democrat of Arkansas, during debate on the measure, is "one which is necessary and essential, but for a portion of the supply of which in time of conflict we have to look to foreign countries." A critical material, on the other hand, was described by him as "likewise an essential material for the prosecution of war, but the supply of which can under ordinary circumstances be obtained in this country."

## U. S. Farm Tool Exports Halved in February

WASHINGTON — The Commerce Department's Machinery Division reports that February exports of farm equipment from the United States were valued at \$3,870,645 compared with \$6,602,373 in February, 1938. All major types of equipment shared in the reduced trade during the month with the fuel injection type tracklaying tractors showing the most resistance to the downswing. American exports of tractors and parts during February were 46 per cent smaller than a year ago, \$2,725,056 compared with \$5,050,049, the Machinery Division reported. Wheel tractors showed the largest decrease, 65 per cent, to \$936,723 against \$2,675,886 in February, 1938.

The Mutual Mfg. & Supply Co., Cincinnati, has been appointed by the Globe Stainless Tubes Co., Milwaukee, as a distributor of stainless steel tubing.

## Government Orders For Week \$356,354

WASHINGTON — Government awards for iron and steel products, as reported by the Labor Department's Public Contracts Division for the week ended March 25, amounted to \$356,354.61. Machinery awards aggregated \$421,966.73. Details of these and related purchases follow:

### Iron and Steel Products

Heppenstall Co., Pittsburgh, rudder stock .....	\$11,873.90
Nathan Straus-Duparquet, Inc., New York City and Norwich, Conn., kitchen equipment .....	9,578.40
Atlantic Metal Products, Inc., Long Island City, metal doors .....	11,726.00
Snead & Co., New York City and Jersey City, N. J., metal and glass partition .....	17,960.00
Ross Galvanizing Works, Inc., Brooklyn, structural angles .....	Indefinite
Carnegie-Illinois Steel Corp., Pittsburgh, steel, angles and shapes ..	66,480.00
Ross Galvanizing Works, Inc., Brooklyn, I-beams, spec. steel ..	12,885.69
Jones & Laughlin Steel Corp., Pittsburgh, I-beams, special .....	10,545.00
United States Steel Products Co., Washington, structural steel .....	41,310.42
Carnegie-Illinois Steel Corp., Pittsburgh, Inland Steel Co., Chicago, steel sheet piling .....	83,782.25
Bethlehem Steel Co., San Francisco, and Seattle, Wash., structural steel .....	12,135.50
Rustless Iron & Steel Corp., Baltimore, corrosion-resisting steel ..	17,005.45
National Malleable & Steel Castings Co., Cleveland, chain, cast steel and chain fittings .....	61,072.00

### Non-Ferrous Metals and Alloys

E. J. Lavino & Co., Philadelphia, chromium ore .....	\$52,080.00
Elmira, N. Y., fire-fighting apparatus .....	Indefinite
Walter Kidde & Co., Inc., New York City, fire-fighting apparatus .....	Indefinite
American-LaFrance Foamite Co., Elmira, N. Y., fire extinguishers ..	32,858.86
The General Fire Truck Corp., Detroit, fire extinguishers .....	Indefinite

### Machinery

Worthington Pump & Machinery Corp., Washington, air compressors .....	\$12,124.00
General Motors Corp., Cleveland Diesel Engine Div., Washington, D. C., and Cleveland, parts for diesel engines .....	25,488.83
Sullivan Machinery Co., New York City, pneumatic bits .....	Indefinite
Baldwin Southwark Corp., Eddystone, Pa., bending roll .....	74,825.00
Tidewater Supply Co., Inc., Norfolk, Va., drill press .....	21,460.00
Jones & Lamson Machine Co., Springfield, Vt., turret lathes ..	18,691.65
The Monarch Machine Tool Co., Sidney, Ohio, lathes, form turning ..	66,291.00
Northwest Engineering Co., Chicago, dragline excavator .....	18,512.00
Bay City Shovels, Inc., Bay City, Mich., power shovels .....	18,400.00
Commercial Engineering Co., Washington, D. C., oil purifiers .....	22,299.94
Hardie-Tynes Mfg. Co., Birmingham, dredge pump impellers ..	12,992.00
Sunroc Spring Water Co., Pine Ridge, Media, Pa., drinking fountains .....	10,165.36
The Galion Iron Works & Mfg. Co., Galion, Ohio, road rollers ..	33,556.60
Airmatic Systems, Inc., New York City, pneumatic tube carrying system .....	12,920.00
Singer Sewing Machine Co., New York City, sewing machines .....	19,309.50
Ransome Concrete Machinery Co., Duncellen, N. J., concrete mixers ..	10,880.00
The Vulcan Copper & Supply Co., Cincinnati, alcohol rectification equipment .....	31,740.00
Gleason Works, Rochester, N. Y., castings, gears .....	12,311.75

## Cut Finishing Costs



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will help you do it!

DEPENDABLE, uniform finish on steel strip and tin plate is the goal of quality production plants. Don't overlook the brush which is the heart of the operation—make sure with Spiral Wound brushes of proved merit. Pittsburgh Plate Glass Company (Brush Division) brushes are delivering complete satisfaction in numerous big production plants.



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These brushes are made with various fills, such as nickel-silver wire, tampico or horsehair—each with a specific purpose. Let our engineering representative show you how you can get uniformity and production. There's no obligation. Write or phone today.

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BRUSH DIVISION • BALTIMORE, MD.

## Get Behind Armament Program; Louis Johnson Tells Industry

**A**DDRESSING the American Conference on National Defense at its industrial preparedness dinner at the Waldorf-Astoria Hotel in New York, Wednesday night, Acting Secretary of War Louis Johnson told industry to "get behind and stay behind the President's armament pro-

gram until every phase of it is enacted into law."

Calling attention to the ominous European situation Colonel Johnson warned that the role of the neutral depends principally on ability to demand respect of all belligerents. Paying tribute to industrial cooperation

with the War Department, he emphasized what industry can do to help national defense. The administration's armament program, he pointed out, is non-partisan, merits whole-hearted support and demands a navy second to none. It calls for an army, it was declared, "small in size, compact in organization, fully equipped with the best of modern arms and capable of expansion to meet any emergency."

### Message from President

Colonel Johnson carried to the conference the President's acknowledgment, at the Chief Executive's request, of industrial contributions. When he had called the President's attention to these contributions, Colonel Johnson said that the President replied:

"That's fine. Add these words for me. In the revival of the spirit of national defense industry is playing a leading and vital role. I am conscious of its loyalty. I appreciate its cooperative efforts. Its patriotic services I commend as an example of good and useful citizenship."

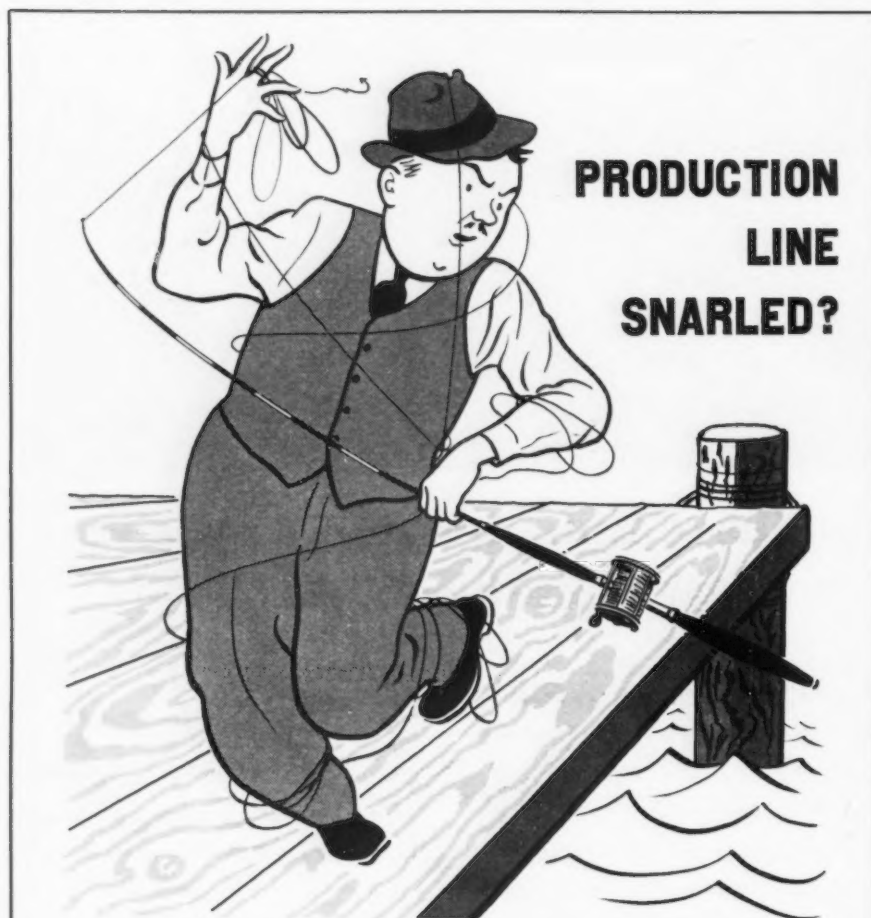
Industry was urged by Colonel Johnson to keep an open mind on defensive needs. He expressed the belief that the President's armament program will go a long way toward strengthening America and toward minimizing dangers of attack. Lastly, he asked that industry become educated in the production of necessary war munitions. He said many of those whom he was addressing were among the 10,000 responsible civilian plants with a record for efficiency, honesty and cooperation that the army has selected to make munitions in time of war.

### "Lifeline of America"

"Of the 10,000 plants allocated for munitions purposes in this country," said Colonel Johnson, "more than 4000 of them are located in the area that extends from Boston to Wilmington and west to Pittsburgh. Pennsylvania has 1431 allocated plants. New York has 1101. Massachusetts has 711. New Jersey has 42. Connecticut has 349. Rhode Island has 148 and Delaware has 29.

"This small territorial belt I have designated is the lifeline of America. More than 60 per cent of our war needs for munitions will have to be manufactured in this congested area."

Pointing out that the War Department stood ready to assist in the program to manufacture critical items, Colonel Johnson said that the \$42,500,000 appropriated for educational orders will provide the necessary



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Many metal finishers have a formula that is bringing them metal cleaning satisfaction—and it's no secret. When a problem crops up, they call in the Wyandotte service man. They find it often saves time, money and labor to be able to call on his experience and the metal cleaning knowledge the Wyandotte organization has accumulated throughout more than a third of a century of service.

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WYANDOTTE MICHIGAN  
DISTRICT OFFICES IN 26 CITIES





means over a period of years to help educate those plants which have been allocated work on strictly non-commercial items.

Telling how industry aids in the procurement of critical raw materials, Colonel Johnson cited different industries which, he said had gone into the open market or otherwise built up reserve stocks, sometimes at great expense. Among such items which he named were chromium, manganese ore, tungsten and rubber.

The conference was told by Colonel Johnson that the United States depends on foreign sources for 99 per cent of its chromium, 95 per cent of its high-grade manganese, 50 per cent of its tungsten, 95 per cent of its rubber, and practically all of its tin.

"When we advised industry of our requirements in tin," he said, "it lent its energy toward the development of a nickel-plated can which today gives every promise of replacing tin for all purposes and at no greater cost."

Among organizations which he specifically named in acknowledging the debt of the War Department to industry were the National Machine Tool Builders' Association, the Hydraulic Machinery Manufacturers' Association, the American Society of Mechanical Engineers, the Society of Automotive Engineers, the Wire Association and the American Institute of Mining and Metallurgical Engineers.

#### ASTE at Cleveland Installs G. J. Hawkey

CLEVELAND—Hydraulic applications in many industries were reviewed recently by J. C. Cotner, vice-president and chief engineer, Logansport Machine Co., Logansport, Ind., at the March meeting of the Cleveland chapter, American Society of Tool Engineers. Approximately 150 persons attended the dinner meeting. Mr. Cotner's address was illustrated by many lantern slides. G. J. Hawkey, president, Cleveland Duplex Machinery Co., was installed as president of the Cleveland chapter, with other recently elected officials.

C. M. Kemp Mfg. Co. of Baltimore announces the appointment of W. C. Green Co., Commercial Arts Building, Cincinnati, as representative in Columbus, Dayton, Cincinnati, and adjacent territory; also the appointment of Beltaire & Drissen, 7328 Hamilton Avenue, Detroit, as representatives for Michigan and adjacent Ohio.

#### Crosley Decision On Small Car Near

CINCINNATI—Lewis N. Crosley of Crosley Mfg. Co., Cincinnati, told stockholders at a meeting March 28, that a possible announcement concerning the company's plans to manufacture a small automobile would be made soon.

The company officials are still

guarding the project carefully and, in answer to all inquiries regarding it, say that a small car has been a matter of experimentation by the Crosley interests for many years.

It is a general understanding that a car with a two-cylinder motor and a short wheel base in size somewhere between an Austin and a Willys is being contemplated. The new car is expected to be marketed at a f.o.b. price near to \$300.

**All Motors**  
(FOR ANY GIVEN RATING)  
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**Alike—**

**MERELY BECAUSE**  
**of STANDARD**  
**NEMA FRAME SIZE**





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in Design and Construction**

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Same size never has and never will mean same quality. From low operating and low upkeep standpoints, there are still ordinary motors — and superior motors.

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HOWELL FEATURES HELP  
CUT YOUR DRIVE COSTS**

1. SUPERIOR INSULATION, both in quality and quantity.
2. DYNAMICALLY Balanced Rotors.
3. HEAVIER Frames and HEAVIER End Plates.
4. VIBROMETER TESTED Ball Bearings.



**HOWELL ELECTRIC MOTORS COMPANY**  
**HOWELL, MICHIGAN**  
**Representatives In All Principal Cities**

ERVIN J. SANNE has been appointed assistant manager of sales of the sheet and strip steel division, Chicago, of Inland Steel Co. FREDERICK A. ERNST has been made district sales manager at St. Paul, and HARRY A. JOHNSON assistant district sales manager at St. Paul. The appointments of Messrs. Sanne and Ernst becomes effective May 1, and the appointment of Mr. Johnson is effective at once.

Mr. Sanne has been district sales manager of Inland at St. Paul since 1936. Prior to that time he was associated with Joseph T. Ryerson & Son, Inc., now a subsidiary of Inland. He began his connection with Ryerson in 1917, and was active in the sales department at Chicago from 1921 to 1936.

Mr. Ernst has been assistant district sales manager at St. Louis since 1936. He entered the steel industry in 1914, with the Trumbull Steel Co. and was successfully affiliated with the Falcon Steel Co., the Granite City Steel Co. and the Columbia Steel Co., prior to his association with Inland at St. Louis in 1928.

Mr. Johnson became associated with Inland at Chicago in 1933, and was on the sales staff of the company at its Milwaukee office from 1935 through 1938, and was transferred to the St. Paul office in January, 1939.

♦ ♦ ♦

T. H. MCSHEEHY, since 1931 Chicago district manager of the Wickwire Spencer Steel Co., New York, has been placed in charge of the company's hardware products department, in addition to his present duties. The department has been moved from the general sales offices in New York to the Mid-western office at 221 North LaSalle Street, Chicago. Mr. McSheehy has had more than 20 years of sales activity in the steel industry with the Pennsylvania Railroad and with the American Steel & Wire Co. He became identified with the Chicago sales office of Wickwire Spencer in 1924.

A. G. BUSSMANN, who continues as manager of the wire sales department, has been appointed manager of the Buffalo district offices. After graduating from Carnegie Institute of Technology, he served as chemist with the New York Public Service Commission and then for 14 years was chemist and welding engineer with the American Steel & Wire Co.

♦ ♦ ♦

B. H. WITHERSPOON, since 1935 vice-president and general manager of the Spencer Lens Co., scientific instru-

ment division of the American Optical Co., Buffalo, has been elected president and general manager, succeeding H. N. OTT, who has been made chairman of the board and who relinquishes active executive responsibilities. Mr. Witherspoon is also a director of the Pittsburgh Testing Laboratories and president of Optical Glass Products, Inc. H. D. RHYNDANCE has been elected vice-president and general sales manager; B. GLENNY is treasurer, and C. W. BARTON, secretary and manager of research and development.

♦ ♦ ♦

C. I. AUTEN, who joined the Tennessee Coal, Iron & Railroad Co., Birmingham, last March as a sales engineer, responsible for the coordination of development of steel for new purposes, has been appointed manager of sales of the cold formed steel division. He will direct sales activity pertaining to the use of cold formed steel products in eight Southeastern states, with emphasis on materials for prefabricated steel dwelling houses and farm buildings. He was formerly vice-president of Truscon Steel Co., Youngstown. C. M. McKENNA, formerly a sales engineer, has been designated assistant to Mr. Auten.

♦ ♦ ♦

A. T. COLWELL, vice-president in charge of engineering, and J. DAVID WRIGHT, secretary, have been elected to the board of directors of Thompson Products, Inc., Cleveland, manufacturer of airplane and automotive valves.

## ... PERIO

ANDREW M. KENNEDY, vice-president, Pittsburgh Coke & Iron Co., has been elected a director of Sharon Steel Corp., Sharon, Pa., succeeding JOHN M. WILSON.

♦ ♦ ♦

BYRON A. FAY, vice-president in charge of production, has been elected a director of Electric Auto-Lite Co.

♦ ♦ ♦

C. B. JAHNKE, general manager of Cooper-Bessemer Corp., Mount Ver-



E. J. SANNE



T. H. MCSHEEHY



A. G. BUSSMANN

# RIONALS...

non, Ohio, and W. C. HEATH, president of A. O. Smith Corp., Milwaukee, have been named to the board of directors of Cooper-Bessemer Corp.



WILLIAM G. HUME has been appointed general manager of sales, Pittsburgh Steel Co., Pittsburgh, effective April 1. He had been manager of sales of the wire and wire products division for the past two years. Before going with Pittsburgh Steel, he was

assistant to the president, Northwestern Steel & Wire Co., Sterling, Ill., having been associated with that company for seven years. During the previous 14 years, he was associated with Keystone Steel & Wire Co., Peoria, Ill., his last position there being general sales manager.

Mr. Hume began his business career in the St. Louis office of Pittsburgh Steel Co. in 1911.

J. K. BEESON has been made assistant general manager of sales, having previously been assistant manager of sales. Most of Mr. Beeson's experience in the steel industry has been with Pittsburgh Steel and he has had various positions in the mill and sales departments since 1930, shortly after graduating from Yale University.

HENRY A. ROEMER, JR., has been appointed manager of rod and wire products sales, having formerly been Pittsburgh district sales manager. Previous to being appointed Pittsburgh district manager Mr. Roemer was district manager at the company's Charlotte, N. C., office, and before becoming associated with Pittsburgh Steel, he worked for the Republic Steel Corp. in a sales capacity.

WILLIAM M. JENSEN succeeds Mr. Roemer as Pittsburgh district sales manager. He formerly was Chicago district sales manager and before that time was Pittsburgh Steel's district manager at San Francisco. He has been with the company for over 20 years.

LEON A. MULLEN, formerly assistant New York district manager, has

been appointed Chicago district sales manager. Before joining Pittsburgh Steel he was associated with Republic Steel Corp. in various sales positions.



EDWARD J. ENGEL, executive vice-president of the Santa Fe Railroad, was elected president and chairman of the board last week to succeed the late Samuel T. Bledsoe. Mr. Engel has been associated with the Santa Fe since 1889 when he began as a stenographer in the purchasing department. A year later he was made a stenographer in the office of E. P. Ripley, then president of the railroad and in 1903 he became chief clerk in the president's office. In 1918 he was appointed vice-president and in April, 1935, became executive vice-president.



LESLIE C. ALLMAN has been appointed vice-president of Fruehauf Trailer Co., Detroit, and director of public relations. He has been with the company 10 years, having joined the company as advertising and sales promotion manager. In 1933 when the trucking industry was the subject of bitter attack by competing transportation interests, and Mr. Fruehauf became leader in the fight in its defense, Allman was given the added responsibility of director of public relations.



H. E. ADELSBERGER, president of the Auto City Plating Co., Detroit, is the newly elected president of the Plating and Rustproofing Association of Michigan.



W. P. WOODSIDE, vice-president of Climax Molybdenum Co., recently was elected to the board of Reynolds Spring Co., Jackson, Mich., replacing JOHN W. MINER, resigned.



E. T. ASHMAN, treasurer of Motor Products Corp., Detroit, has been elected to the company's board of directors to fill a vacancy.



RUSSELL A. BLANCHARD, connected with the Detroit Brass & Malleable Works for 14 years, has been appointed Detroit district sales representative of the Extruded Metals Corp., Belding, Mich.



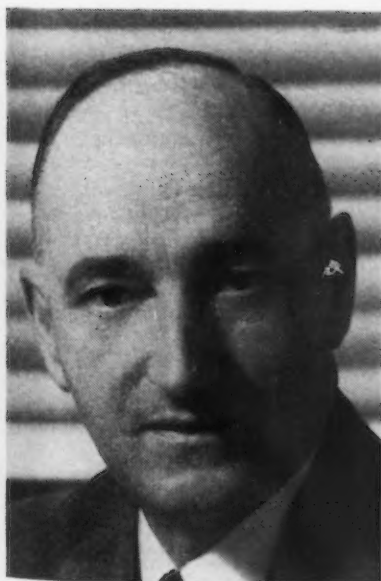
FRANK E. MULLALY has been elected to the board of the Federal Screw Works, Detroit.



J. R. BURKEY, member of the Ohio State Highway Department since 1911,



F. A. ERNST

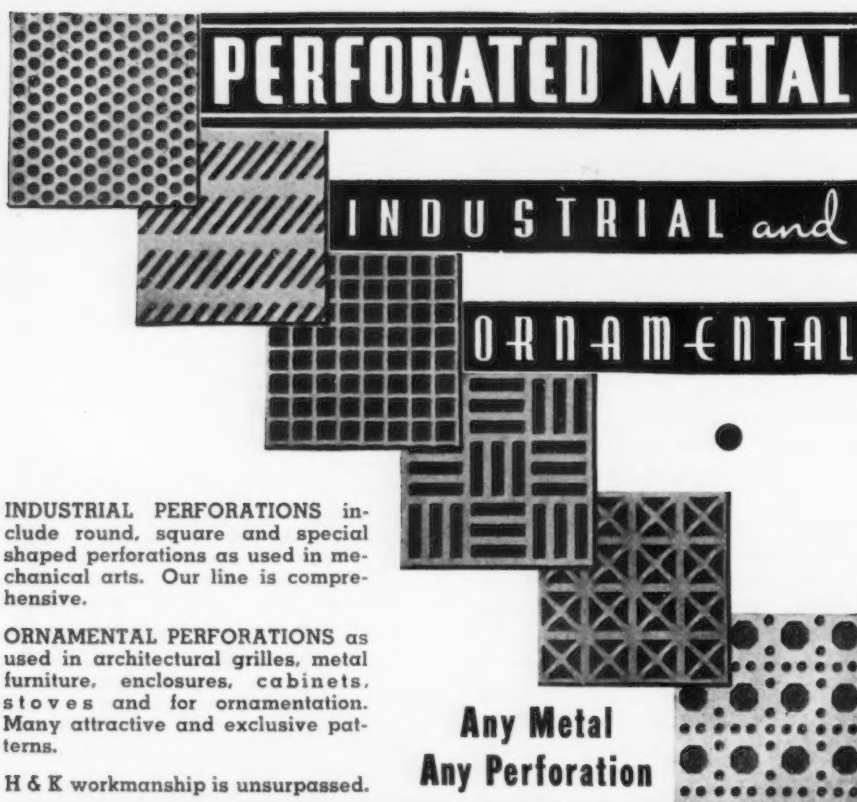


B. H. WITHERSPOON



C. I. AUTEN





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CONTINENTAL STEEL CORPORATION  
KOKOMO, INDIANA  
Plants at Kokomo, Indianapolis, Canton

**OPEN HEARTH STEEL**  
WIRE • Bright Basic, Annealed, KONIK, Special Manufacturers, Nails, Barb Wire, Fence.  
SHEETS • Black, Galvanized, Roofing and Siding.

and chief engineer of the Ohio Bureau of Bridges for 14 years, has become consulting engineer in the steel piling division of the Union Metal Mfg. Co., Canton, Ohio.

♦ ♦ ♦

H. A. BISHOP, formerly with Petroleum Iron Works Co., has joined the Youngstown Steel Tank Co., Youngstown, as sales representative.

♦ ♦ ♦

JAMES W. HOOK, for several years head of the New England Council and president of the Geometric Tool Co., New Haven, has been made president of the United Illuminating Co., succeeding ALBERT W. KRAFT.

♦ ♦ ♦

A. C. HANSON, who formerly handled the northern Indiana and southern Michigan territory for Foote Brothers Gear & Machine Corp., Chicago, has been made district representative for the Detroit territory, succeeding EVERETT G. AKRIDGE.

♦ ♦ ♦

DAVID DASSO has resigned as vice-president of the American Locomotive Co., diesel engine division. He will be retained in a consulting capacity by the Locomotive company and will continue as representative of Sulzer Brothers, Ltd., Winterthur, Switzerland.

♦ ♦ ♦

B. D. LANDES has been appointed general sales manager of the H. K. Porter Co., Pittsburgh. A graduate of Purdue University, school of engineering, he was manager of engineering service for the A. M. Byers Co., Pittsburgh, and prior to that associated with the Harnischfeger Corp., Milwaukee.

♦ ♦ ♦

ROBERT E. ADAMS and W. G. N. HEER have been added to the technical staff of the Battelle Memorial Institute, Columbus, and have been assigned to the process metallurgy division.

♦ ♦ ♦

EVERETT MICHAELS, of Hyman-Michaels Co., Chicago, has been appointed chairman of the finance committee of the Institute of Scrap Iron and Steel, Inc., New York.

♦ ♦ ♦

E. R. WALKER has been appointed chairman of the engineering committee of the Industrial Unit Heater Association, Detroit. Chairmen of other committees include: A. G. DIXON, finance; M. F. MAY, membership; T. BROWN, publicity; J. F. G. MILLER, trade relations, Eastern division; and J. M. FRANK, trade relations, Western division.

## ... OBITUARY ...

JOHN E. NELSON, general manager of the Duluth branch of Republic Steel Corp., died March 29 from heart disease. He had been employed by the company 40 years. He was 60 years old.



OTTO KAFKA, head of the steel exporting company of the same name, New York, died at his home in Bay-side, Queens, N. Y., on March 24, aged 59 years. He had been in that busi-



**ELWOOD BURDSALL**, secretary-treasurer of the Russell, Burdsall & Ward Bolt & Nut Co., whose death on March 10 was announced in these columns on March 16.

ness since he came to this country from Bohemia in 1905.



JAMES S. EDMUNDSON, 57 years old, former general manager of the Charcoal Iron Co., Manistique, Mich., died March 28 at Houston, Tex.

### Chile to Open Vanadium Deposits on May 1

THE Chilean government has authorized the Mining Delegations of the republic to accept from May 1, 1939, applications for the exploitation of vanadium deposits that were reserved for the state since March 21, 1930, according to a report to the Department of Commerce from the office of the American Commercial Attache at Lima.

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For what SERVICE is it best adapted ?  
What kind of CONTROL is most suitable ?*

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SPRINGS



## Pittsburgh Steel Seeks Tonnage Rate Revision

**P**ITTSBURGH — Pittsburgh Steel Co.'s request to the SWOC for certain tonnage rate reductions over and above basic hourly rates involves a situation which is similar to those adjudicated several times in the past few years at other steel companies, under section 11 of the standard SWOC contract, which covers settlement of inequalities in individual wage rates.

It has been general practice for steel companies and the union to negotiate new tonnage rates when plant improvements, which resulted in a substantial increase in unit production, have been installed. Pittsburgh Steel's present request for an adjustment does not involve current basic wage rates.

The number of employees involved in this matter is small and, according to company officials, if the company's request is granted, affected employees in all cases will be actually receiving

more weekly wages than was the case prior to the time when the plant improvement became effective.

## Armco Cites Attacks On Price of Steel

**A**ERICAN ROLLING MILL CO.'s net sales for 1938 declined 39 per cent from 1937 to \$70,441,606 while shipments during year ranged from 29 per cent of capacity in January to almost 60 per cent in December, George M. Verity, chairman, and Charles R. Hook, president, report to stockholders. They said:

"The drastic decline in industrial activity resulted in such a low percentage of operations over such a substantial period that, together with the constant attack on steel prices by many uninformed persons and with the natural competitive situation, it ultimately resulted in a breaking down of price structures throughout the entire iron and steel industry.

The new year, the Armco executives said, began with many influences making for upward trends in business activity. The company's net loss for 1938 was \$1,307,334 compared with a net profit of \$8,231,334 in 1937.

## Inland's Purchase of Drum Company Approved

**C**HICAGO—The acquisition of Wilson & Bennett Mfg Co., makers of steel drums, barrels and pails, by the Inland Steel Co. was approved last week at a special stockholders meeting. The issuance of 50,000 additional shares of stock was authorized, of which 45,000 will be exchanged for 243,000 shares of Wilson & Bennett capital stock, the remaining 5000 shares to be reserved for future issuance. This company will be operated by Inland as a wholly owned subsidiary.

## Bill Would End Scrap Exports to Japan

**W**ASHINGTON — The latest scrap, embargo proposal to be introduced in Congress is one by Representative John M. Coffee, Democrat of Tacoma, Wash., designed to prohibit exports to Japan. It would also embargo exports of armament-producing machinery and engines capable of being used in airplanes, tanks and artillery.



With competition today as keen as you ever have seen it—with hourly rates moving up as work hours go down—your management is looking for every possible way to reduce costs.

Any achievement that shows a saving represents an Inside Profit. Many companies have made a profit by reducing handling costs—from siding to storeroom, from storeroom to machines—from machines to shipping platform—with Baker Industrial Trucks.

As a specific instance, The Baker Truck shown above, enabled one company, unloading steel from box cars, to reduce the cost from \$28 to \$5 per car—an Inside Profit of \$23.

You are not short-sighted if such savings in your plant are not apparent to you. Planning inside truck operation is a specialized job,—a job for the Baker Man whose experience enables him to look over your plant and to make definite recommendations that will lead to Inside Profits.

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**BAKER INDUSTRIAL TRUCK DIVISION**  
OF THE BAKER-RAULANG COMPANY  
2175 WEST 25TH STREET • CLEVELAND, OHIO



# Colored Stainless Steel

(CONTINUED FROM PAGE 45)

a few small pits were visible only on the edges of the processed material. The solution remained unchanged.

To evaluate the above results more clearly, they are summarized chronologically in the tables on page 43. Somewhat similar contact corrosion results were obtained in experiments performed by a large disinterested laboratory.

The tabulated data, supplemented by the preceding description apparently shows:

(1) The contact corrosion resistance of processed 6-Cr steel is superior to unprocessed stainless steel of the 18-8 (KA<sub>2</sub>S) type.

(2) The contact corrosion resistance of unprocessed 6-Cr steel is greatly superior to unprocessed stainless 18-Cr steel.

(3) The contact corrosion resistance of processed 18-Cr steel is superior to unprocessed 18-Cr steel.

(4) The contact corrosion resistance of processed 18-8 stainless steel is superior to all forms of processed or unprocessed steels.

Since the above long time corrosion and contact corrosion tests showed such marked improved corrosion resistance, it was decided to determine whether this superiority existed in short time destructive boiling acid tests such as hydrochloric, sulphuric, aqua regia, and so forth. These tests were conducted upon 18-8 steels. The results obtained are shown in the tables on page 43.

The data show the relative corrosion resistance of colored (Bachite) and plain stainless steel of the 18-8 type. It can be readily seen from this table that the corrosion resistance of 18-8 is greatly increased by the Bachite process. This is especially true in boiling sulphuric acid, since there is practically no loss of weight. Although this condition may not exist forever, it nevertheless increases the corrosion resistance to boiling dilute sulphuric acid to an unheard of degree. This is also true in the other acids. If these tests were conducted for long periods of time, the percentage corrosion increase of the processed material over the unprocessed would be so great that there would be no comparison inasmuch as the solution attack of the unprocessed steels increases the temperature to such an extent that it accelerates solubility or corrosion.

To note whether this condition also existed in the cheap, low-alloy grades of chromium steels (6 per cent), series of processed and unprocessed steels were given accelerated tests. The results are shown in the tables. As can be readily observed, the Bachite processed material apparently is superior

to the unprocessed material without any exception.

In order to obtain a relative comparison between processed 6-Cr and unprocessed 18-8, the same tests were made. The results tabulated show that in boiling hydrochloric acid (1:1) colored 6-Cr is superior to 18-8. It is also slightly superior in the ferric chloride and sulphuric acid tests. However, this superiority automatically decreases with longer duration of time in the boiling acids since the

## All geared 21" 24" and 28" SUPER SERVICE UPRIGHTS

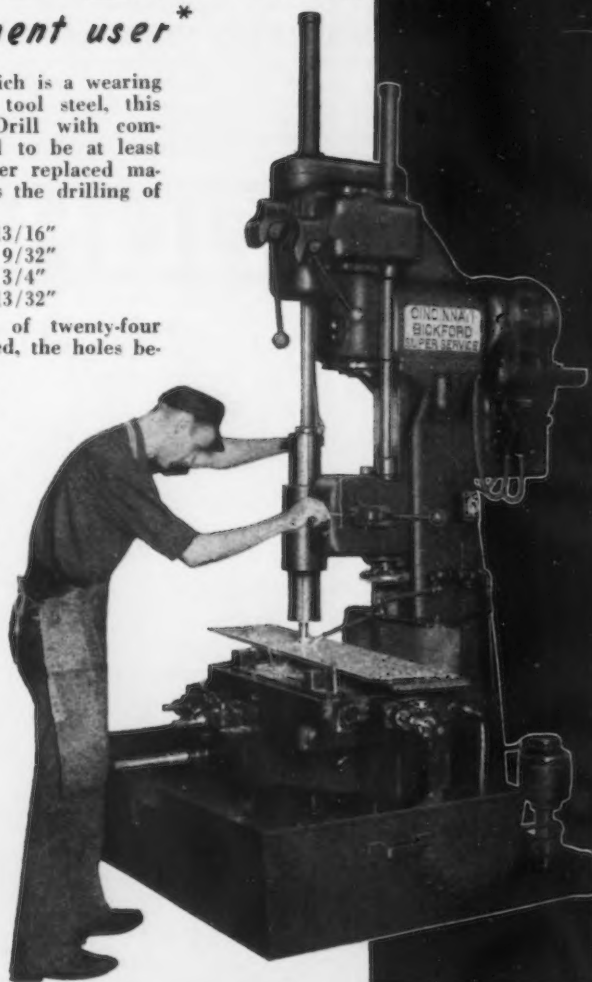
"At least  
**TWICE AS FAST**"  
says prominent user\*

On the work shown, which is a wearing plate of oil hardening tool steel, this Super-Service Upright Drill with compound table, is reported to be at least twice as fast as the older replaced machine. This job involves the drilling of holes

two 1-13/16"  
two 1- 9/32"  
four 3/4"  
twenty-four 13/32"

and the counterboring of twenty-four 3/4" holes. No jig is used, the holes being located with the aid of the compound table and center-distances held to limits of ±.005". Time required is now 1 1/2 hours, former time 3 hours. A similar replacement and like savings may be possible in your shop. Write for complete information.

\*Customer's name on request.



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The MARVEL No. 8 Band Saw will save you hours of machining time on roughing-out work. It will make all types of straight and angle cuts, notching, coping, mitering and an almost unlimited variety of work without special setting-up; and, in doing all of this work for you, it will keep you "outside" profits at home. Now you can cut your own die plates sizes from bar stock or billets... and turn "warehouse cutting extras" into extra cutting profits. With equal ease a No. 8 will handle big work (up to 18" x 18") and the small work down to the finest drill rod. Equipped with power and hand feeds, the blade is fed through the work (which remains stationary). Blade column tilts and cuts at any angle up to 45° right or left. Automatic knock-off stops machine at any desired cut depth.

There's no question of it, MARVEL No. 8 leads the field in versatility and is your logical first saw. And it fills a definite place in the MARVEL Line, the world's most complete line of metal sawing machines.

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Write for  
Bulletin 800-4  
No. 8 Band Saw



base material rapidly dissolves and thereby disintegrates the protective action of the surface. In boiling sulphuric acid, or in nitric acids, processed 6-Cr is inferior to 18-8, inasmuch as the base material dissolves readily, as it does in the boiling sulphuric acid.

Inasmuch as all the tests that were reported upon above were made on specimens processed jet black, the results obtained by a large disinterested laboratory, which showed similar results are interesting since they were obtained upon light-brown colored specimens instead of black.

The findings of the above investigations certainly indicate that the Bachite process improves the corrosion resistance of all types of steel to such an extent that processed cheaper grades of steel could possibly be substituted for more expensive stainless grades in certain applications.

Another great advantage claimed for the Bachite process, as previously mentioned, is that the surface hardness of the material is increased, which implies greater resistance to wear and abrasion. This, of course, is an important factor in various applications for the following reasons: (a) It produces a surface protection, corrosion resistance, increased hardness, wear and abrasion resistance; (b) it eliminates binding when two surfaces are in contact with each other; and (c) it prevents contact corrosion which occurs when two metals are in contact.

Let

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They'll no doubt show you how built-for-the-job Farquhar Hydraulic Presses can earn you a bigger profit — cutting operating costs, speeding up production. They have done so time and again for companies like General Electric, RCA-Victor and Ruberoid. Whether it's a small, separate pressing job or a whole hydraulic press installation, they'll be glad to show you how Farquhar can save you money. Give them a call today.



300 ton  
Stamping Press

### High-Purity Zinc— A Modern Metal

(CONCLUDED FROM PAGE 57)

but also as the anode in the electrolytic bath. In depositing zinc coatings, impurities in the solution cause pits, rough coats and other imperfections. Since the purity of the solution is paramount, the purity of the anode is equally vital.

The signal success of electro-galvanizing for wire has inevitably led to its consideration for sheet. The fact that such a different form of material carries with it special problems of its own, such as uniformity of deposit and different methods of producing a bright surface, as well as the general problem of producing a galvanized surface that paint will adhere to, will not permanently block this development. There is no doubt that in time (perhaps soon) electro-galvanized sheet will appear on the market. Like electro-galvanized wire,

**A. B. FARQUHAR CO., LTD.** 402 DUKE ST.  
YORK, PENNA.

this product should require special high-grade zinc for anodes.

It has been stated that, for normal conditions of exposure, a good coating of zinc is by far the cheapest method of protecting steel, and that galvanized steel far out-distances all competitive materials in point of cost per year of service. General acceptance of this statement will come only with wider public understanding of the meaning of the word "good" in this connection. A renewed demand for zinc coated steel for many types of severe service, and the acquisition of new applications is likely to be accelerated by the wider use of special high-grade zinc, and by the use of heavier coatings, applied to a growing extent, by electro-deposition.

## Foundry Congress Will Open June 13

THE 1939 International Foundry Congress will open June 13 in London when more than 30 papers on all phases of ferrous and non-ferrous foundry practice will be presented during a four-day program. Tours of the principal foundry centers of Great Britain will be conducted June 18-24 and June 25-30. Information regarding the congress may be obtained from the Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, 3, Eng., or from the American Foundrymen's Association, 222 West Adams Street, Chicago.

## 2000 Join Steel Plant Payrolls in February


TWO thousand employees were added to steel industry payrolls during February, the American Iron and Steel Institute says in a report which shows:

	Feb.	Jan.
Total employees...	453,000	451,000
Total payroll ...	\$57,044,000	\$59,348,000
Hourly wage rate	\$2.7c.	\$2.6c.
Hours per week.	33.5	32


## Factory Wages Up 0.6% in February

WEEKLY pay envelope of the average factory worker contained \$26.11 in February as compared with \$25.95 in January, an increase of 0.6 per cent, according to latest reports from 25 manufacturing industries analyzed by the statistical division of the National Industrial Conference Board. Average length of the work week of employees in these industries in February was 36.8 hr. compared with 36.6 hr. in January.

The Bill for Interruptions in Performance comes high



Accurate Springs keep things running smoothly



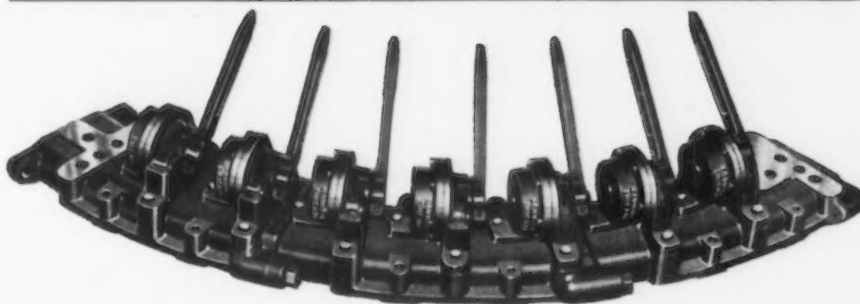
**B-G-R**  
SPRINGS  
SMALL STAMPINGS  
WIRE FORMS

An ability to solve knotty spring difficulties ... to get customers out of holes ... has gained B-G-R the confidence of many spring users. B-G-R helps you to design the *right* spring ... and the combined resources of two complete plants see to it that *your* schedules are maintained.



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Hannifin Manifold Valves simplify control of several air or hydraulic cylinders and allow faster operation. Hannifin disc-type valve design is simple and positive. Since there is no packing there is no leakage or packing maintenance trouble.

Manifold valves are available in several types, for control of any type of air or hydraulic equipment. Also hand and foot operated, spring return, rotary, electric and special models. Write for Valve Bulletin 34-A.

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ENGINEERS • DESIGNERS • MANUFACTURERS • Pneumatic and Hydraulic Production Tool Equipment

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AIR CONTROL

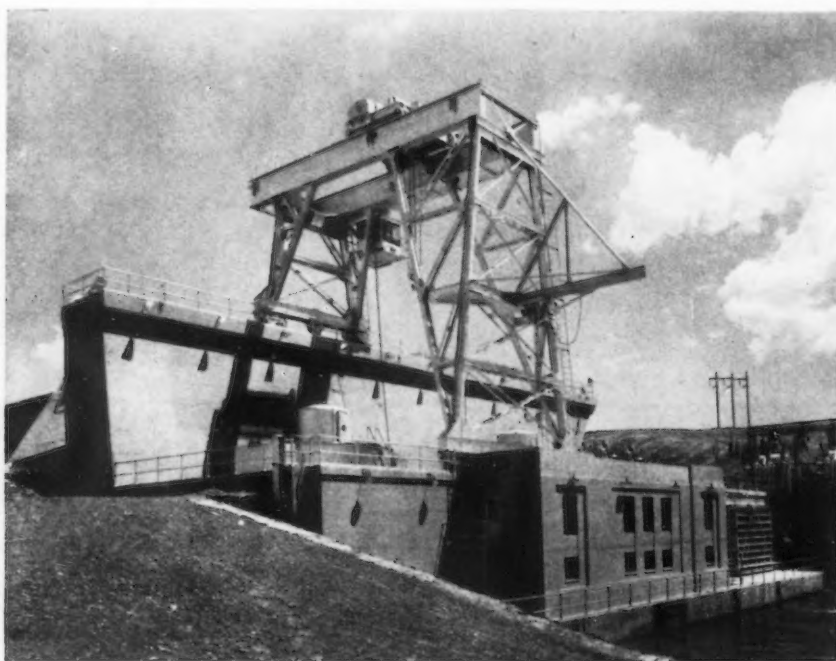


## This Week on the Assembly Line

(CONTINUED FROM PAGE 63)

the making of revealing statements from the floor of the convention. For instance, Richard T. Frankenstein, a vice-president who is ambitious to be elected president, lashed out at the CIO, apparently angered because John L. Lewis and the CIO are supporting R. J. Thomas as president and are favoring the elimination of all vice-

presidencies in an attempt to quell the factional arguments. Frankenstein has attempted to explain the failure of the Ford unionization drive by blaming his assistant, Zygmund Dobrzynski. Dobrzynski, who is now allied with Homer Martin and the independent UAW, replied in Detroit that Frankenstein spent \$126,000 to organ-



### A Tiger does the Big, Unusual Job as well as "everyday" handling problems

The Tiger crane above is one of many special applications made for hydroelectric and other utilities, where heavy loads are handled intermittently. Yet this 75-ton crane has the same high quality of design and workmanship which make the Tiger so acceptable in iron and steel plants everywhere. The Tiger is "tops" for smooth, quiet operation at lowest cost for big as well as ordinary handling jobs.

*Send for Bulletin 300*

WHITING CORPORATION, 15601 Lathrop Ave., Harvey, Ill.



ize Ford Motor Co. employees and signed up only 7000 members, most of whom have since left the union.

Martin's independent UAW is having difficulty meeting its payroll, incidentally. The weekly expenses, including personal expenses for officers and board members, and wages for organizers and office employees, is said to be approximately \$5,000. Last week paychecks were several days late.

The two UAW conventions, one here in Detroit sponsored by Martin, and the CIO convention in Cleveland, have provided an opportunity to size up the union to determine its strength and potential power.

Besides R. J. Thomas, who has been elected head of the CIO-supported faction and is favored by John L. Lewis for re-election, and Homer Martin who is heading the independent group, there are separate factions headed by Frankenstein, Walter Reuther, George F. Addes, secretary-treasurer, Wyndham Mortimer and Ed Hall. Besides there are many officers of the large local unions who have ambitions to help rule the international union. From the convention activities so far and from the events of recent months, it appears improbable that the CIO-supported group will be able to weld a very strong organization at this convention. After it is over, Homer Martin will probably pick up a number of the non-adhering units and increase the strength of his group somewhat. It seems safe to state now that months will pass, and other major incidents occur, before the auto-labor situation again assumes any definite proportion.

### 69 T. C. I. Employees Receive Medals

SIXTY-NINE employees whose service with the Tennessee Coal, Iron & Railroad Co., Birmingham, totaled 1935 years received United States Steel Corp. service medals during the first quarter of 1939. The service average for those honored during the period was 28.04 years.

### UAW Proposes Union Labels for Tools

THE United Automobile Workers Union (CIO division) this week at Cleveland considered a proposal that the union's members insist on using tools and raw materials produced in shops with union contracts.

## Steel Losses Top \$10,500,000 in 1938

THE American steel industry in 1938 operated at a loss exceeding \$10½ million, as compared with a profit of more than \$212 million in 1937, according to a financial analysis of the industry by THE IRON AGE.

The 22 companies covered by the survey reported net sales of \$1,634,550,992 in 1938 against \$2,755,648,425 in 1937. The margin of loss in 1938, before preferred dividends, was 0.6 per cent. The loss on each ton of steel produced in 1938, as based on those companies reporting production, was 67c., while the loss per ton of capacity was 16c.

The companies covered by the survey, representing 93 per cent of the nation's ingot capacity, have assets aggregating \$4,201,779,000.

The analysis will be published in detail in next week's IRON AGE.

## British Commission Ends Scrap Trade Inquiry

WITH the departure on Friday of this week of Capt. Leighton Davies, the commission from Great Britain which has been studying the steel scrap situation in the United States will have completed its work here. No new contracts were placed with American exporters of scrap, but additional tonnage was arranged for on some of the old contracts.

Capt. Davies gave the following statement to THE IRON AGE regarding the commission's purpose in coming to this country:

"Much has been written by the press of what was thought to be the purpose of the visit of Capt. Leighton Davies, E. B. Muscroft and Harold Shillitoe to America, and all manner of guesses were made as to the quantity of scrap they intended to purchase on behalf of the International Scrap Convention. It is the intention of the commission that it should be made known that their specific purpose was to investigate on the spot the general condition of the scrap trade on this side and, having completed that particular object, the commission is breaking up with the return by the Normandie last week of Mr. Muscroft, leaving Capt. Leighton Davies to continue investigations of the particular industry in which he is mainly interested, that of the manufacture of steel sheets and tin plate. The commission wishes to state that their visit has

been very satisfactory and they are returning as they intended without in any way disturbing the United States scrap market.

"It has always been the desire of the commission and the International Scrap Convention that the United States home market should have every protection, and the commission is convinced more than ever that with the full cooperation of the steel makers of the United States the export market should not and need not be the cause of raising the price of scrap, as they

are anxious only to obtain material from sources unavailable to the home steel makers, and they are also fully alive to the fact that the home users are entitled and should have first call on all scrap materials arising within the reach of the home market. It is only that unreachable tonnage properly geographically situated for export that should find its way into the export market, thus causing no interference or difficulty whatever to the makers of steel in the United States of America."



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With mill and general offices centered in one location, the Thomas Steel Organization is geared for prompt action on the needs of customers and daily meets the demands of emergency.

Executive, production, sales and engineering departments co-ordinate their efforts quickly to satisfy unusual requirements. Their combined knowledge is immediately available to suggest methods for reducing your costs, improving your product or giving you better service.

Our long experience in cold rolled strip steel manufacture is dovetailed with your modern, efficient processes to achieve high uniform quality and closely controlled unit cost of your output.



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Electro Copper Coated  
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**THE THOMAS STEEL COMPANY • Warren, Ohio**  
SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

## Gary Could Fill Navy Needs in One Turn E. C. Barringer Says

THE role of iron and steel, and also scrap, is primarily peace, and their use as war materials is a perversion of their nature and accounts for only a very small portion of their total consumption. Edwin C. Barringer, executive secretary of the Scrap Iron and Steel Institute, told the 200

foundrymen attending the Rutgers Regional Foundry Conference at New Brunswick, N. J., last Saturday.

Pointing out that the entire tonnage of steel required for present naval expansion program, which will take  $3\frac{1}{2}$  years to complete, could be rolled at the Gary works of the Carnegie-Illinois Steel Corp. in one turn, the scrap institute executive declared that the growing conception of metals as the fabric of war was unjust.

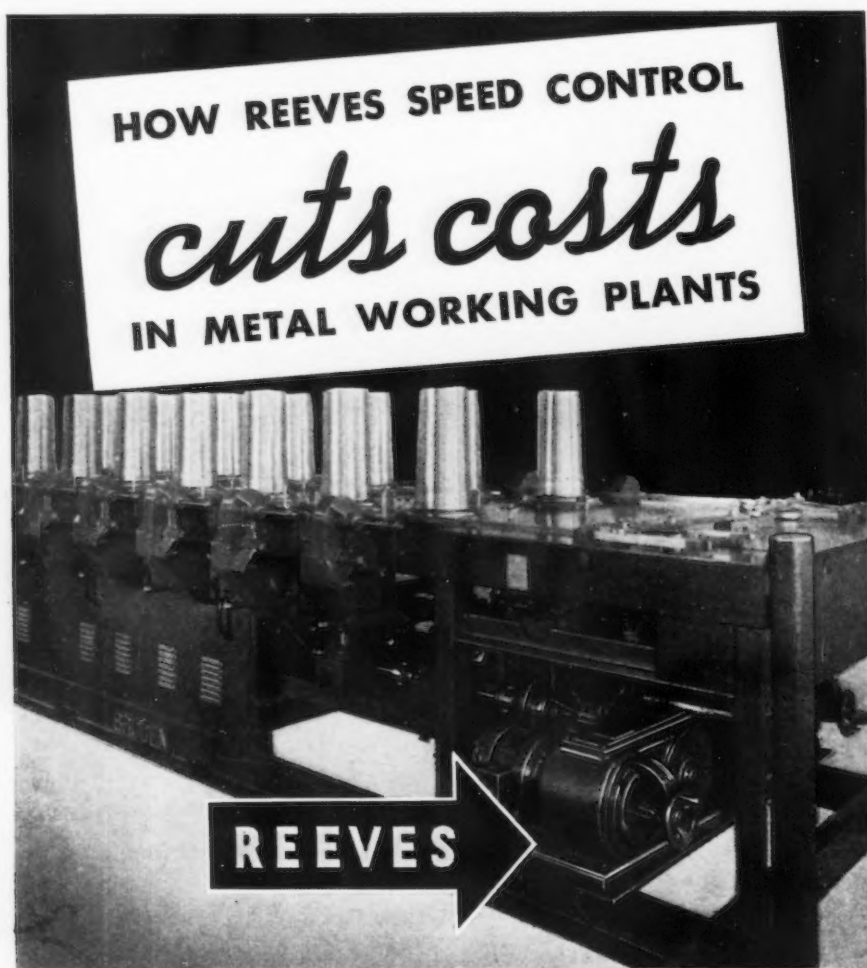
Commenting on the nation's scrap

metal resources, Mr. Barringer estimated that material on hand in foundries, steel mills and dealers' yards equalled between six to nine months' supply. This, he said, was in addition to vast quantities, now invisible, which would be brought out if prices were higher.

His address was made at a banquet that marked the conclusion of the first Rutgers Regional Foundry Conference at Rutgers University, New Brunswick, N. J. Registration at the conference, which was sponsored jointly by the Philadelphia and Metropolitan New York-New Jersey chapters of the American Foundrymen's Association and Rutgers University, was slightly over 200.

Marshall Post, president of Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., and national president of the A.F.A., who served as toastmaster at the banquet, told the foundrymen that he perceives a new trend to castings, and indicated recent developments in automobile construction as illustrating this trend. Mr. Post estimated that at present there were 5800 foundries in the United States, employing 360,000 men and producing approximately 10,000,000 tons of castings a year.

Preceding the banquet, four technical sessions were held at which the following presented papers: Norman L. Mochel, Westinghouse Electric & Mfg. Co., Philadelphia; J. C. Pendleton, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J., and H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y. Sam Tour, Lucius Pitkin, Inc., New York, consulting engineers, served as chairman of the afternoon sessions, while John Howe Hall, Philadelphia, consulting engineer, was chairman of the morning sessions.



Many sizes of wire are spooled evenly and tight on this Reeves-equipped Spooling Machine.

- There are more ways than one of cutting costs in metal working plants. If machines operate at *full capacity*; if they operate at *correct speeds* for the exact degree of heat treatment or other processing required; if the speed of drums and spools can be made to vary with changing diameters in winding operations; if speeds can be adjusted to meet changes in materials, sizes and weights of products—in short if the machines are equipped with *Reeves Variable Speed Control*, costs are certain to come down.

REEVES builds a complete line of variable speed control units for installation as *standard equipment* on all types of metal working machines. The same units are easily and inexpensively applied to machines in service. Write for further information. REEVES PULLEY COMPANY, Dept. I, Columbus, Indiana.

**REEVES SPEED CONTROL**

## Bethlehem's Operations In 1938 Safest on Record

OPERATIONS in 1938 were the safest on record for Bethlehem Steel Co. A comparative study of safety work just completed by the company's safety staff reveals that in 1938 fewer accidents per man-hour occurred in its steel plants, in shipbuilding, mining and other operations than in any year in which special accident records have been kept. The monthly average number of workers last year was 82,680. Since 1916 when the present program of accident prevention was instituted accidents have been reduced by 80 per cent.



## Wheeler Interprets Commodity Clause of New ICC Act Bill

WASHINGTON—Reports that the commodity clause proposed in the new Wheeler-Truman bill to revise the Interstate Commerce Commission Act would operate in reverse and prohibit manufacturing companies from shipping their products on affiliated or subsidiary railroads and other transportation systems were denied last week by Senator Burton K. Wheeler, chairman of the Senate Interstate Commerce Committee and co-author of the measure.

The Senator told THE IRON AGE that the possibility of such an interpretation had been called to his attention but he emphasized that such was not the intention when the bill was drafted. He said he would seek to clarify the provision to remove all doubts as to its scope.

The commodities clause in the present act prohibits "any railroad company" from carrying products manufactured by an affiliated or subsidiary company or by one in which the railroad has a direct or indirect interest. The revised clause, as proposed under Sec. 12 of the Wheeler-Truman bill, would broaden the prohibition to include "any carrier, other than a carrier by air."

### Effective in 1941

Effective Jan. 1, 1941, it would be unlawful for any carrier, other than a carrier by air, to transport in interstate commerce any commodity, except timber and its products, "manufactured, mined or produced by or under the authority of such carrier or any subsidiary, affiliate, or controlling person of such carrier, or any such article or commodity in which such carrier, affiliate, or controlling has any interest, direct or indirect" . . . .

The transportation of products carried for the conduct of the carrier's business is allowed under the present law and could be continued under the proposed new provision.

E. M. Reidy, of the ICC Bureau of Law, who assisted in drafting the revised clause, said it was designed to meet the decision of the United States Supreme Court in the Elgin, Joliet & Eastern case, handed down May 25, 1936. In that case the Government, based on information given by the ICC, brought suit against the E. J. & E. on the ground that its stock was owned by the United States Steel Corp., and that it transports products

of subsidiaries of the Steel Corporation.

### Found No Violation

The Supreme Court said that the railroad had not violated the commodities clause. The Court pointed out that the Steel Corporation is a non-

operating organization, holding the shares of both the railroad and the producing steel companies. The transportation, it was held, was not illegal in the absence of a more intimate relation between the companies than that shown. The railroad, said the Court, "functions as a separate corporate carrier under immediate control of its own directors, no one of whom is on the board of the holding company; it owns all necessary equipment, makes its own contracts, manages its own



## Accurate "Spotting" requires a HAND-GEARED TROLLEY TYPE A-E-CO LO-HED HOIST

**When—**1. The haul is short and load heavy or awkward.  
2. The load must be accurately spotted, regardless of weight.  
3. The load, because of its nature, must be carefully moved (chemicals, hot foundry ladles, etc.)—

**The hand-gear trolley type A-E-CO Lo-Hed hoist—the one operated by a chain is the logical choice.**

For high-lights of this hoist see A-E-CO POINTS (below).  
For full details of Lo-Hed hoists, send for our new catalog today.



**OTHER A-E-CO PRODUCTS:** Taylor Stokers, Marine Deck Auxiliaries, Hele-Shaw Fluid Power.

- Available in capacities from 1/2 to 6 tons. Operates on Standard I-beam or track of any make.
- Low headroom—stacks materials higher than any other hoist.
- Safe, fool-proof.
- Compact, strong, simply constructed.
- Protected against dust, moisture, fumes.
- Heavy duty, ball-bearing HOIST MOTOR.
- Automatic lowering brake.
- Ball or roller bearings at vital points.
- Improved plow-steel cable.
- 100% positive automatic stop.
- Efficient spur-gear drive . . . and
- LO-HED COSTS LESS PER LIFT**

**A-E-CO  
Lo-Hed  
HOISTS**

**AMERICAN ENGINEERING COMPANY**

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finances, serves its patrons without discrimination and apparently to their satisfaction."

The Wheeler-Truman bill would retain the present rate-making rule used for railroads, in lieu of modification as proposed by rail representatives and would extend its coverage to all common carriers. It would retain the "long-and-short haul clause" which has been the subject of considerable controversy and would direct the ICC to investigate certain questions of transportation service and cost.

The two Senators offered the bill as a phase of their long-range program for rehabilitating the railroads.

## Sheet & Tube Employees To Give Ideas On Waste

YOUNGSTOWN—A contest for Youngstown employees to bring out ideas on how to prevent waste has been announced by Youngstown Sheet & Tube Co. The company asked ideas on how to better satisfy customers, improve products, get more business conserve raw materials, cut scrap losses, avoid duplication, and save time, space, handling, supplies, fuel and power.

## Industrial Unit Heater Association Meeting April 26

The second regular meeting of the Industrial Unit Heater Association, Detroit, will be held in Cleveland on April 26, at which time further consideration will be given to the standardization program sponsored by the Engineering Committee.

# February Iron-Steel Imports Lower; Exports Show Little Change

AT 134,777 gross tons, exports of iron and steel products (other than scrap) from the United States in February were just 11 tons smaller than in January, according to preliminary reports of the Metals and Minerals Division of the Bureau of Foreign and Domestic Commerce. A year ago exports amounted to 203,850 tons.

Plates were the principal product exported in February, shipments of 9997 tons having been made to The Netherlands, 2030 tons to Italy, and 1912 tons to Sweden. The trade in non-alloy black sheets, 19,886 tons, included 6270 tons, which went to the United Kingdom, 2378 tons to Brazil, and 2356 tons to Canada.

Japan was the leading market, having taken 18,149 tons and including 9256 tons of non-alloy and 3332 tons of alloy steel ingots, and 2998 tons of pig iron.

Scrap exports at 224,913 tons were 2971 tons under the 227,884-ton January figure and were more than 30,000 tons less than the 256,790 tons exported in February, 1938.

Imports of iron and steel products totaled only 17,736 tons, compared with 24,331 tons in January. Ferromanganese was the principal product imported—the total of 2889 tons coming mostly from Norway (1301 tons) and Czechoslovakia (1264). Belgium was the chief source of imports, her

total of 5296 tons, including 1850 tons of structural shapes, 1197 tons of hoops and bands, and 802 tons of bars.

## February Imports of Iron and Manganese Ores

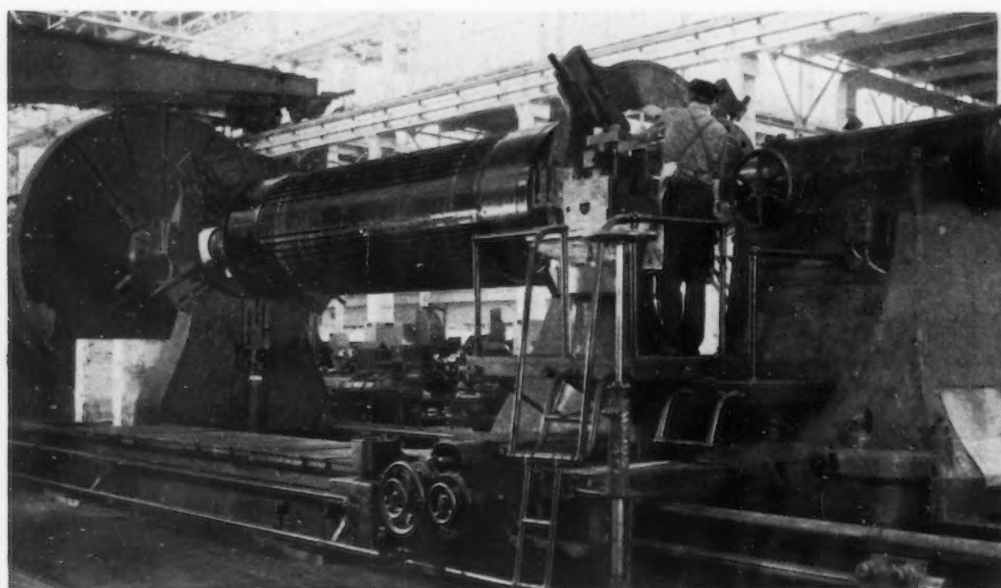
(In Gross Tons)

	Iron Ore		Manganese Concentrates, 35 Per Cent or Over	
	1939	1938	1939	1938
Canada .....	60	6		
Cuba .....	21,000		5,572	5,567
Chile .....	130,500	129,200		
Spain .....				
Norway .....	7,038	7,000		
Sweden .....	7,157	7,200		
French Africa ..				
Russia .....			6,208	42
India .....			1,591	
Brazil .....			3,351	
Gold Coast .....			9,353	6,986
Other countries. 13,016		8,408	14	
Total .....	178,771	151,814	26,089	12,585

## United States Imports of Pig Iron by Countries of Origin

(In Gross Tons)

	February		Two Months Ended February	
	1939	1938	1939	1938
United Kingdom. ....				
British India ...	399	2,842	601	8,333
Germany .....				
Netherlands .....	99	100	321	4,260
Canada .....	105	412	267	508
France .....				
Belgium .....				
Norway .....				
Sweden .....				
Russia .....				
Other countries. ....				
Total .....	603	3,354	1,189	13,101



THE new consolidated tool and die shop of the Ford Motor Co. at its Rouge plant includes facilities such as this large lathe which is being used to restore alinement to the shaft of a 57-ton rotor which is part of the new 110,000 KW type of generator now being installed at the Rouge Plant No. 1 power house. The coupling shaft was only 1/64th of an inch out of line and required removal of less than a single pound of metal from the unit, but the job required four and a half hours from the time it was centered in the lathe until completed.

Imports (In Gross Tons)	February		Two Months Ended February	
	1939	1938	1939	1938
Pig iron .....	603	3,354	1,189	13,101
Sponge iron .....	266	150	300	161
Ferromanganese <sup>1</sup> .....	2,889	634	6,039	1,281
Spiegeleisen .....	2,033	306	3,009	431
Ferrochrome <sup>2</sup> .....	273	48	347	104
Ferrosilicon <sup>3</sup> .....	7	....	32	1
Other ferroalloys <sup>4</sup> .....	1,413	....	4,746	222
Scrap .....	7,484	4,492	15,662	15,321
Pig iron, ferroalloys and scrap .....	....	....	....	....
Steel ingots, blooms, etc. ....	7	21	14	254
Billets, whether solid or hollow .....	711	588	1,907	1,092
Wire rods .....	718	609	1,922	1,346
Semi-finished steel .....	162	263	527	308
Concrete reinforcement bars .....	63	103	163	228
Hollow steel bars .....	1,385	1,403	3,573	3,257
Merchant steel bars .....	....	....	....	....
Iron slabs .....	79	116	129	126
Iron bars .....	....	33	....	37
Boiler and other plate (including skelp) ..	96	1,118	267	1,539
Sheets, skelp, and saw plate .....	2	4	2	7
Die blocks or blanks, etc. ....	12	7	15	8
Tin plate, taggers' tin and terneplate .....	2,412	2,072	5,946	5,219
Structural shapes .....	5	....	5	....
Sashes and frames .....	....	....	....	....
Sheet piling .....	146	338	387	522
Rails and track material .....	217	603	487	904
Welded pipe .....	1,137	3,378	7,637	8,138
Other pipe .....	....	....	2	19
Cotton ties .....	1,670	1,263	3,564	3,440
Other hoops and bands .....	1,654	1,899	2,666	5,141
Barbed wire .....	282	127	567	200
Round iron and steel wire .....	....	2	1	2
Telegraph and telephone wire .....	166	337	436	600
Flat wire and steel strips .....	134	165	374	378
Wire rope and strand .....	251	111	491	370
Other wire .....	796	898	1,349	1,434
Nails, tacks, and staples .....	6	9	18	21
Bolts, nuts and rivets .....	63	27	108	58
Horse and mule shoes .....	10,738	14,276	28,764	31,956
Rolled and finished steel .....	15	8	15	19
Malleable iron pipe fittings .....	100	53	132	254
Cast iron pipe and fittings .....	94	151	318	324
Castings and forgings .....	....	....	....	....
Total .....	19,149	19,589	46,813	49,220

<sup>1</sup> Manganese content; <sup>2</sup> chrome content; <sup>3</sup> silicon content, and <sup>4</sup> alloy content.

Exports (In Gross Tons)	February		Two Months Ended February	
	1939	1938	1939	1938
Pig iron .....	4,524	54,332	10,849	90,329
Ferromanganese and spiegeleisen .....	9	55	9	57
Other ferroalloys .....	22	48	125	237
Scrap, iron and steel .....	222,704	255,627	448,138	611,408
Scrap, tin plate .....	1,351	1,114	2,990	1,724
Waste-waste tin plate .....	858	49	1,669	195
Pig iron, ferroalloys and scrap .....	229,468	311,225	463,780	703,950
Ingots, blooms, billets, sheet bars .....	10,140	28,983	23,506	66,534
Ingots, etc., alloy steel, including stainless	3,335	514	4,316	602
Skelp .....	637	510	1,379	1,131
Wire rods .....	360	783	713	3,271
Semi-finished steel .....	14,472	30,790	29,914	71,538
Bars, plain and reinforcing .....	8,959	9,974	19,641	28,337
Bars, alloy steel .....	1,144	382	2,496	927
Bars, stainless steel .....	4	137	15	146
Iron bars .....	54	63	115	412
Plates, plain and fabricated .....	21,041	13,141	32,057	40,296
Plates, alloy steel .....	70	186	108	474
Plates, stainless .....	6	12	9	22
Sheets, galvanized steel .....	5,433	4,922	12,759	8,860
Sheets, galvanized iron .....	335	413	764	589
Sheets, black, plain steel .....	19,886	19,488	44,154	36,058
Sheets, alloy steel .....	31	393	378	1,264
Sheets, stainless .....	41	105	93	184
Sheets, black iron .....	577	441	1,153	1,090
Hoops, bands, strips, plain steel .....	7,977	6,970	15,034	12,314
Hoops, bands, strip steel, alloy .....	34	20	46	35
Hoops, bands, strip steel, stainless .....	45	46	201	150
Tin plate and taggers' tin .....	10,968	15,063	23,638	34,136
Terne plate (incl. long ternes) .....	221	232	379	1,312
Structural shapes, plain material .....	5,603	7,276	11,007	17,914
Structural material, fabricated .....	2,285	4,091	3,744	9,010
Sheet piling .....	546	34	713	877
Tanks, steel .....	374	2,389	1,816	7,472
Steel rails .....	4,750	7,041	7,929	20,215
Rail fastenings, switches, spikes, etc. ....	1,689	1,126	2,694	2,549
Boiler tubes .....	442	446	835	859
Casing and oil line pipe .....	5,330	9,675	9,593	15,619
Pipe black and galv. welded steel .....	2,843	1,879	5,529	3,812
Pipe, black and galv. welded iron .....	529	627	1,224	1,052
Plain and galvanized wire .....	3,822	2,749	7,962	6,308
Barbed wire and woven wire products .....	2,278	1,165	5,007	2,199
Wire rope and other products .....	934	801	1,792	1,697
Nails and tacks .....	1,503	1,451	3,419	2,545
Bolts, nuts, rivets and washers except track	549	616	1,135	1,316
Other finished steel .....	463	235	879	1,224
Rolled and finished steel .....	110,766	113,589	218,318	260,874
Cast iron pipe and fittings .....	1,978	1,993	4,752	3,576
Malleable iron screwed fittings .....	248	216	557	424
Carwheels and axles .....	1,327	1,315	2,712	3,876
Castings, iron and steel .....	541	492	956	1,072
Castings, alloy steel, incl. stainless .....	200	48	278	77
Forgings, plain .....	618	931	1,015	1,447
Forgings, alloy steel, incl. stainless .....	72	41	80	100
Castings and forgings .....	4,984	5,036	10,350	10,572
Total .....	359,690	460,640	722,362	1,046,934

## • GREAT BRITAIN •

### ... Tightness in scrap hampering steel production

LONDON, April 4 (By Cable)—With a lightening of tension in European political affairs, there is more confidence in returning commercial demand. Steel production is going ahead, but the relighting of additional steel furnaces is hampered by tightness in scrap and more basic pig iron furnaces are commissioned to make up deficiencies.

Air Ministry order for airplane sheds, costing \$1,000,000 with erection spread over 12 months, will absorb much steel. Shipbuilding prospects are brighter as the Government is proposing a subsidy on shipping. Already several mercantile orders have been placed and numerous new tonnage inquiries are in the market.

Continental steel market is still quiet, with consumers only covering urgent requirements. Australian and United States competition is still strong in some markets. The International Thin Sheet Cartel has reaffirmed black galvanized sheet prices on 24 gage basis. British makers reduced export prices of black sheets up to 23 gage by 2s 6d.

Tin plate is strong with active unfilled orders nearly 4,500,000 base boxes. Output is close to 60 per cent. Some makers, fearing steel shortage, are asking up to 1s per base box over schedule for far forward export.

## • CANADA •

### ... Business in the Dominion is quiet

TORONTO, April 4—New business generally is quiet in the Canadian steel markets, with aggregate orders about 25 per cent below those at the beginning of the year. While prospective business appears to run to considerable volume, current buying is confined largely to spot requirements. Canadian Pacific Railway in its 1938 financial statement, reveals no appropriation for rolling stock or new equipment. Export contracts are holding up well and additional large orders are expected. Plant operations are holding at about 60 per cent.

Merchant pig iron sales show sharp retraction from the beginning of the year. Most of the larger local melters are carrying large stocks of iron and are not expected in the market until Great Lakes' navigation opens, giving some advantage in freight rates. Current sales are in lots of one or two cars.



# ... THE NEWS IN BRIEF ...

New type subway car built of aluminum.—Page 55.

April auto schedules revised downward following decrease in the last week of March. Sales softening blamed for industry's hesitation. Spring weather expected to bolster retail selling efforts. UAW factions unable to weld organization together again.—Page 60.

TNEC may end before its steel inquiry is concluded; larger companies now sending replies to questionnaires.—Page 64.

v Figures show PWA bought 4.72 per cent of steel purchased during five and a half years ended Dec. 31, 1938.—Page 66.

Senator LaFollette, after \$150,000 investigation of industry, offers "oppressive labor practices" measure.—Page 67.

Southwestern territory tariff schedules on scrap are suspended to Nov. 1.—Page 67.

Senator Mary Norton introduces bill designed to correct faults in Wage-Hour law.—Page 68.

February exports of industrial machinery from U. S. total \$20,752,959, or 12 per cent under like month of 1938.—Page 68.

U. S. supplies 66.12 per cent of Italy's scrap imports during 1938, Commerce Department reports.—Page 69.

Electrical manufacturing industry concludes talks with Commerce Department officials.—Page 69.

Senate approves yearly expenditure of \$10,000,000 for strategic materials as preparedness move.—Page 70.

Farm equipment exports from U. S. total \$3,870,645 in February against \$6,602,373 in corresponding month of 1938.—Page 70.

Government orders for iron and steel products during latest reported week total \$356,354.—Page 71.

Acting War Secretary Johnson tells industry to "get behind President" until armament program is completed.—Page 72.

Crosley Mfg. Co. stockholders are told the company soon may issue an announcement regarding a plan to manufacture small automobiles.—Page 73.

A.S.T.E. Cleveland chapter hears review of hydraulic applications in industry.—Page 73.

Youngstown Sheet & Tube Co. employees enter contest to bring out ideas for reducing waste.—Page 73.

Chile will receive applications for exploitation of state-reserved vanadium deposits, May 1.—Page 77.

Armco sales down 39 per cent in 1938, executives cite effects of constant attack on steel prices.—Page 78.

Inland Steel Co. shareholders approve acquisition of Wilson & Bennett Mfg. Co.—Page 78.

Pittsburgh Steel Co. negotiates with SWOC regarding tonnage rate reductions; basic rates unaffected.—Page 78.

Latest scrap embargo proposal to be introduced in Congress would prohibit shipments to Japan.—Page 78.

Weekly pay envelope of average factory worker contains \$26.11 in February compared with \$25.95 on January.—Page 81.

International Foundry Congress will open June 13 at London.—Page 81.

Steel mill payrolls in February advance by 2000 employees.—Page 81.

Sixty-nine employees of Tennessee Coal, Iron & Railroad Co., receive service medals.—Page 82.

The CIO faction of the UAW consider plan to insist on "union labels" for all tools.—Page 82.

British commission completes investigation of American scrap trade.—Page 83.

The steel industry in 1938 operated at a loss exceeding \$10½ millions, against a \$212 million profit in 1937, according to an analysis by THE IRON AGE.—Page 83.

Gary works could fill entire needs of Navy's building program in one turn, E. C. Barringer tells eastern foundrymen.—Page 84.

Bethlehem Steel Co. operations in 1938 safest on record, with accidents reduced 80 per cent since 1916.—Page 84.

New ICC Act bill won't prohibit manufacturing companies from shipping on subsidiary roads, Senator Wheeler tells THE IRON AGE.—Page 85.

What the machine industry means to the world.—Page 88.

France orders 1000 airplane engines, valued at \$14,000,000, from Pratt & Whitney division of United Aircraft Corp.—Page 92.

Allegheny Ludlum Steel Corp. operations so far in 1939 are on profit-making basis, stockholders are told.—Page 92.

U. S. Steel Corp. produced less finished steel last year than in 1902, the first full year of its history, Edward R. Stettinius, Jr., tells stockholders.—Page 93B.

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## MEETINGS

April 17 and 18—American Zinc Institute and the Galvanizers Committee, St. Louis.
April 20 and 21—Concrete Reinforcing Steel Institute, Augusta, Ga.
April 26 to 29—Electrochemical Society, Columbus, Ohio.
May 15 to 18—American Foundrymen's Association, Cincinnati.
May 16 and 17—American Steel Warehouse Association, Chicago.
May 22 to June 8—Society of Automotive Engineers, world congress, in various cities.
May 24 and 25—National Metal Trades Association, Chicago.
May 25—American Iron and Steel Institute, New York.
May 25 to June 1—Triple Convention (American Supply and Machinery Association, the National Supply and Machinery Distributors' Association and the Southern Supply and Machinery Distributors' Association), on board the S.S. Monarch of Bermuda.
Oct. 23 to 27—National Metal Congress, Chicago.

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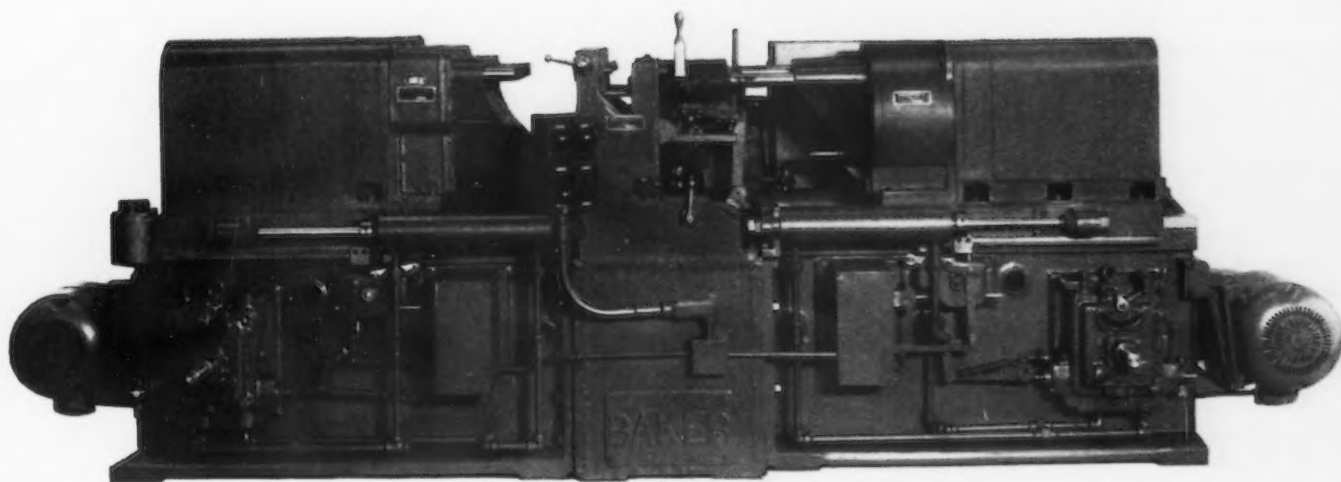
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## THREE WAY HORIZONTAL DRILLING MACHINE

LEFT UNIT: 30-HH hydraulic feed having 15" width of ways, 32" length of saddle, 9 spindle multiple head.  
RIGHT UNIT: 10-HH hydraulic feed having 10" width of ways, 32" length of saddle, 5 spindle head.  
REAR UNIT: Rack bar and pinion feed auxiliary unit with 8" width of ways, 16" length of saddle, 3 spindle head.

Two position holding fixture arranged for the rechucking of one part and loading one new part while drilling holes in flanges and port faces of intake and exhaust manifolds.

# ★ BAKER ★

# What the Machine Tool Industry Means to the World\*

**Y**OU have invited me to come here today to tell you something about the machine tool industry and what it means to the modern world. I greatly appreciate the honor, but approach the subject with some misgivings for two reasons. First, the importance of our industry is such that

it is impossible to give you more than a bird's-eye view of it in the time allotted to me. Again, I have been active in the industry for over half a century, and am so steeped in its history, achievements and future possibilities that I am afraid that my enthusiasm may run away with me.



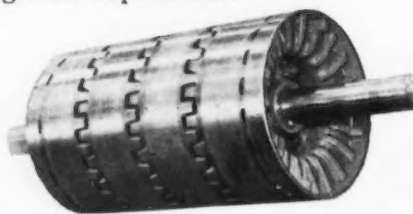
**L**OST—A. W. O. L.—vanished without a trace—it seems incredible, but a checkup could easily reveal such a loss in many foundries not using magnetic separators.

It really wouldn't be hard to find that iron. It's in the dump pile, the slag pile, the sand pile—worst of all, it's mixed in the sand of molds being poured right now. Not only is that iron lost to productive use, but some of it is ruining castings, causing imperfections, rejects, lost profits.

Sprues, risers, gates and fine shot iron must be taken out of used foundry sand. Magnetic separation is the only positive way — the most economical way to remove this iron. And the Dings High Intensity Magnetic Pulley is the most powerful pulley on the market size for size! It will pay for itself with the iron it saves, the time it saves, the improved castings it makes possible. Write for details today and send a sample of your used sand for free magnetic analysis.

**DINGS MAGNETIC  
SEPARATOR COMPANY**

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**The Most Powerful  
Magnetic Pulley on the  
Market—Size for Size!**

Bronze spacers and coil covers which do not short-circuit lines of force, reduce pulling power—**air-cooled construction** (corrugated radial openings, longitudinal openings, impeller hub design) for cooler operation, more power—these are exclusive features of the Dings High Intensity Magnetic Pulley—features that make it the pulley for your plant.

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*High Intensity*  
**MAGNETIC  
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**For Material Handling — DINGS LIFTING MAGNETS**

With this in mind I shall be temperate in my remarks and simply state that machine tools are the master tools of industry. As you all know, we are concerned entirely with metal working, although the parts and machines made by us are essential to the production of wooden, paper, textile, plastic and almost all other products.

In my office I have a picture in which I take great pride. It epitomizes the basic importance of the metal-working industries. It illustrates the story of the iron-worker and King Solomon, taken from a Jewish legend.

"When the Temple at Jerusalem was completed King Solomon gave a feast to the artificers employed in its construction. On unveiling the throne it was found that a blacksmith had usurped the seat of honor on the right of the king's place, not yet awarded. Whereupon the people clamored and the guard rushed to cut him down."

"LET HIM SPEAK!" commanded Solomon.

"THOU HAST, O KING, INVITED ALL CRAFTSMEN BUT ME? YET HOW COULD THESE BUILDERS HAVE RAISED THE TEMPLE WITHOUT THE TOOLS I FASHIONED?"

"TRUE!" decreed Solomon. "THE SEAT IS HIS OF RIGHT. ALL HONOR TO THE IRONWORKER."

The blacksmith's statement, with much broader applications, is as true today as it was in Solomon's time. The machine tool and the countless machines which it produces influence almost every phase of our physical life. Without it we could not produce, commercially, most of the necessities and luxuries which we enjoy.

## Makes Interchangeability Possible

The outstanding contribution of the machine tool is the fact that it makes mass production possible through the principle of interchangeability of parts.

It is impossible to exaggerate the importance of the machine tool in shaping our modern pattern of living. Almost everything we use or consume today is produced, in at least some vital part, by the machine.

And the machine tool is the mother of the machine! It produces the machine; it keeps it in repair and thus permits it to function effectively after it is produced.

\* Selections from an address by August H. Tuechter, president, Cincinnati Bickford Tool Co., before the Credit Association Luncheon Group, Cincinnati, April 4, 1939.



I have spoken of its essential part in the production of all types of transportation equipment. Food products are planted, harvested, processed, packed and delivered by machine tool-made machines. Construction, road-building, mining and petroleum producing equipment, industrial and domestic electrical equipment, the printing press, the radio, the telephone and telegraph are the products of machine tools or machines made by machine tools. Paper, rayon and other wood products, drugs, toilet and sanitary articles, tobacco products, clothing, shoes, automobile tires, other leather and rubber goods and countless conveniences and necessities are manufactured, processed or packed by machines made on machine tools.

And finally the machine tool is the only machine which reproduces itself; for machine tools are made on and by machine tools.

Aside from the fact that it has made innumerable products of high quality available, the machine tool has rendered many other services to the world. Because of it working hours have been shortened from the 1850 average, which was well above 60 hr. per week, to the 40 hr. average week of today.

At the same time, thanks largely to machine tools, wages have increased until they are now four times what they were before the Civil War (when the industry was just getting into commercial production); three times what they were before the Spanish American War; and double those prevailing before the World War.

#### The Basis of Our Living Standard

All of these services have contributed to the development of the American standard of living — the highest the world has ever known. Of equal importance, however, has been the achievement of the industry in reducing the cost per unit through mass production, to the point where both the necessities and luxuries of life can be produced and sold at prices that are within reach of most of us.

To cite a few examples, an unbiased committee of investigation not connected with the machine tool industry reported only three weeks ago that without modern tools, a modern automobile would cost about \$18,000. At this price not more than 50 could be sold in a year, in contrast with the 3,000,000 to 5,000,000 now bought annually.

The same group reported that the

labor cost of producing a watch which sells for \$1.50 would be \$1,040 if produced by old machine shop methods.

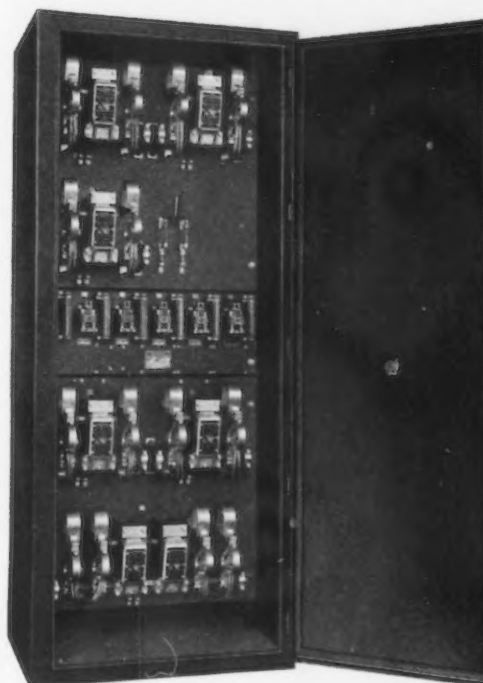
Without mass production today's hundred dollar typewriter would cost a thousand dollars. A dollar alarm clock would have to sell for \$25.00 or more. Electric refrigerators made experimentally are said to cost six times as much as those made on production assembly.

Judged by modern standards our industry is not a large one. It comprises

only about 250 companies, many of which are very small or else make only an occasional tool, in addition to their other business. The distinctive and important companies number less than 150, most of which are members of the National Machine Tool Builders' Association.

Nor is the capital investment impressive. It amounts to only about \$150,000,000. Many individual corporations in the utility and manufacturing fields have a larger invested

## EC&M MAGNETIC STARTER for WOUND ROTOR MOTOR



**T**HIS illustration shows a push-button-operated EC&M Full Magnetic Starter for use with a 600 HP, 2300 Volt A.C. Wound Rotor Motor driving a crusher in a cement mill. The primary circuit to the motor is handled by an EC&M Type ZHS, Bulletin 1062-B, oil-immersed, high voltage contactor, arranged for separate mounting. Resistors for the secondary circuit are EC&M Nickel Alloy type and are also arranged for separate mounting.

In general, with a drive of this type, it is desirable to apply maximum motor torque during acceleration to get the motor up to speed quickly. The new EC&M Frequency Relays, used for automatically controlling the acceleration of the motor, provide the ideal solution by permitting maximum desired torque to be maintained at the motor shaft during the accelerating cycle.

Write or wire us today for further information on EC&M Frequency-Relay-Controlled Magnetic Starters for wound rotor motors.



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FOR CRANES, MILL DRIVES AND  
MACHINERY • BRAKES • LIMIT  
STOPS • LIFTING MAGNETS AND  
AUTOMATIC WELD TIMERS

capital than our entire industry, and yet it is doubtful that *any* of these corporations could have attained their present size or could operate as at present without the machine tool.

There are some other peculiar facts about our industry. Most of our companies are owner managed. We have had few insolvencies and I believe that our credit is reasonably good. We don't know whether we are "economic royalists" or not although we are tempted to believe it when we look at

our tax bills. Be that as it may, while we manage to make a decent living, *no one has ever gotten rich* from the industry itself.

Our business is subject to extreme peaks and valleys. Periods of relative prosperity are inevitably followed by periods when we do hardly any business at all; but in these low periods we must use the reserves accumulated in prosperous times to continue to improve our designs and make our tools more efficient, for the machine tool in-

dustry can never stop and rest on its laurels.

Again we can never benefit from the profits of mass production, for ours is a special order business and our machine tools must be built a few at a time, as demand warrants. It is a paradox that the very industry which has made mass production possible cannot apply mass production in its own production.

Despite our undebatable service in increasing wages, shortening hours and making possible "more goods for more people," our industry and all related machine building—and—using industries have been under fire, for the last ten years.

#### Want to Handcuff the Machine

Hundreds of starry-eyed young dreamers, some of whom never did a really productive day's work in their lives, and even a lot of college professors, who should know better, are burning the midnight oil to prove that the machine is the major cause of depression and unemployment—that it should therefore be taxed into submission; that new patents and improvements should be legally prohibited; that we should stop where we are, if not actually recede from our present position.

Well, let's consider the facts. Time permits me to discuss but one application, but I assure you that I could cite many equally pertinent illustrations in other fields.

The automotive industry presents the best known illustration. In normal times about 50,000 men are employed in the building of machine tools. Let us assume that all the machine tools they build in a given time are for automotive production—which, of course, is far from the truth, as the automotive industry accounts, at the most, for only about 30 per cent to 35 per cent of our business. But for this purpose, let us say that we employ 50,000 men, all working for the automotive industry. Through the use of the machine tools they build, it is possible for 500,000 men to be directly employed to build automobiles, trucks and kindred products.

Hundreds of thousands more are employed in directly related and service industries too numerous to outline. All together reliable authorities state that 6,000,000 people earn their living directly from the automotive industries.

Some statisticians go even further to say that 10,000,000 derive part or all of their living from the industry and

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from service to motorists. In the latter group they include operators of overnight lodgings, tourist camps, roadside stands, etc.

A recent survey shows that 25 per cent of all workers gainfully employed in industry today are earning their living in industries which either did not exist in 1900, or were just getting into production at that time. This is easy to understand when we recall that this group of industries includes among others, automotives, aviation, rayon, radio, and the manufacture of a great variety of household appliances and plastic products.

It may be further noted that *all* of these industries are dependent upon the machine tool, either for direct production or for the building of the machines which are used in production.

#### The Outlook for Business

Now a few remarks about the attitude of machine tool builders with respect to the outlook for our business. Our orders, like yours, pick up as business in general begins to show signs of improvement. When manufacture of any kind quickens its pace there is need for new machine tools to replace old equipment that is inadequate for the new demands made upon it. We saw the beginning of such an upturn last summer, but it has been exceedingly slow in developing into a full fledged recovery. Why?—Well, as one looks back, a dozen or more reasons can be boiled down to two: uncertainties abroad and a lack of confidence in political direction of affairs at home. Perhaps a little more emphasis could be placed on the latter than the former.

Some types of machine tools have benefited—one does not like that word exactly for what I am going to say—by the uncertainties abroad. The race for armaments has brought our industry a very fair volume of business over the past two and a half years, so that the industry's Index of Orders did not drop quite so low in 1937 as the Index of Manufacturing activity in general in this country. In the same manner foreign orders have given the appearance of a more than usual increase in business since last summer. Looking only at the Index it would be easy to assume that machine tool builders are enjoying a fair measure of prosperity.

Naturally, we take foreign orders as they come. They keep our plants on their toes; they give work to our employees, and they keep our product before our foreign customers. But there are some disadvantages:

It is a spotty business; orders come

along spasmodically, and often in large chunks, placed here and there with a few builders, so that most of the industry gets but little out of it.

The foreign business of the last two years has been a "fear" business, arising out of a hurry to set up adequate defense against war. From past experience machine tool builders know that such business has an unsound base, and one of these days the new orders that arise from it will not only vanish, but the machine tools and ma-

terials bought under such stress will remain to glut the market when the storm is over.

So our hopes turn to our domestic business, and we should like to see that take on a better hue. We believe the foundations are laid for a *real recovery* here as soon as some of our own doubts and uncertainties are cleared away. We see signs of it in the news of new plants being erected or expanded here and there; new products ready to come on the market; and a

Over 800 sizes  
Carried  
in Stock

**JOHNSON**  
GENERAL PURPOSE  
BRONZE BEARINGS

Write for  
**FREE**  
CATALOGUE  
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of supply.

● Here is a bearing service designed to meet your needs. The exact size you require in any quantity . . . every bearing machine finished, ready for assembly . . . stocks conveniently located for immediate service.

From this range of over 800 sizes, it's an easy matter to select your needs. Inside diameters graduate from  $\frac{1}{4}$ " to  $4\frac{1}{4}$ " in every practical dimension. Outside diameters run from  $\frac{3}{8}$ " to  $4\frac{1}{2}$ ". Lengths range from  $\frac{5}{8}$ " to 9". Any size can be altered, turned, cut, drilled or oil grooves added on short notice and at little expense.

Every Johnson General Purpose Bearing is cast in S. A. E. 64—Copper 80%; Tin 10%; Lead 10%. This alloy combines, in the correct proportions, all the necessary elements to insure the greatest performance.

Specify Johnson Bronze on your next order. Test them in comparison to any you have ever used. Convince yourself that here is the best general purpose bearing bronze available.



**JOHNSON BRONZE**  
*Sleeve* BEARING HEADQUARTERS  
505 S. MILL STREET • NEW CASTLE, PA.



more tolerant attitude in general toward the idea of making a little profit out of making goods.

On the whole, therefore, machine tool builders look for a slow strengthening of the mild upturn that began last summer. We expect to see production improve and employment increase; slowly, perhaps, but with an upward trend nevertheless. By the end of this year we expect it to be apparent that 1939 has been a better year than 1938.

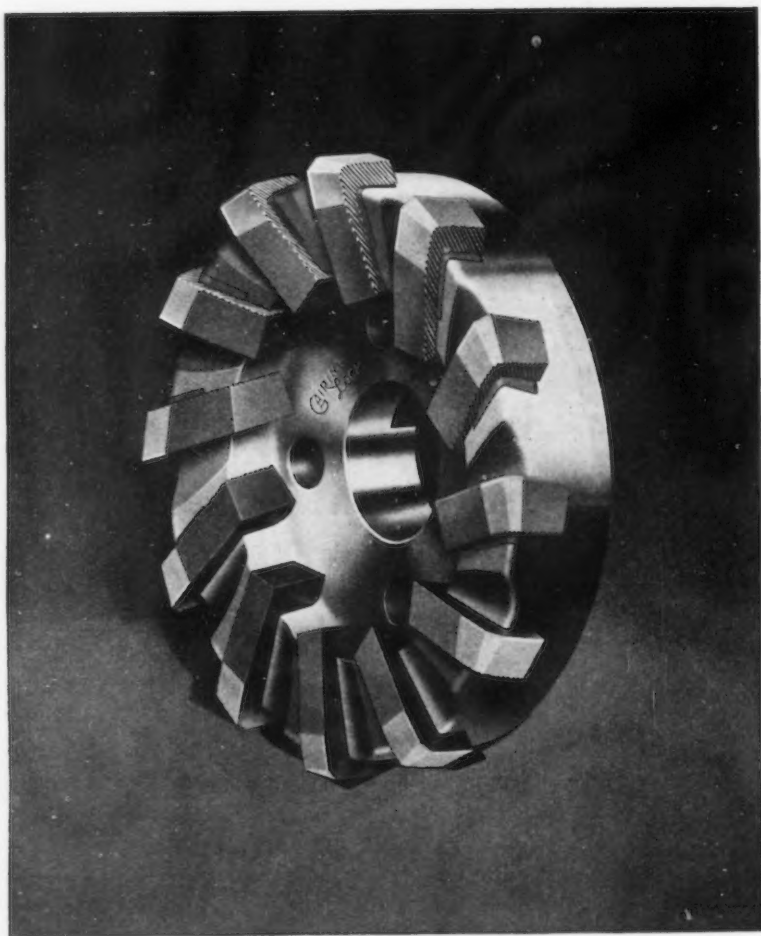
### Allegheny Ludlum On Profit-Making Basis

**P**ITTSBURGH — Operations for Allegheny Ludlum Steel Corp. during the last quarter of 1938 were on a profitable basis and activity so far in 1939 has likewise been profitable, W. F. Detwiler, chairman, and H. G. Batcheller, president, recently told stockholders.

The corporation's average number of employees in 1938 was 71 per cent

of the 1937 total, while the 1938 payroll was 56 per cent of 1937. The difference in percentages reflects efforts to divide the work among as many employees as possible.

Up to Aug. 16, 1938, the Allegheny Ludlum Steel Corp. report includes the performance of the former Allegheny Steel Co., while from Aug. 16 to Dec. 31, 1938, is included the experience of the merged companies. Gross sales amounted to \$18,261,231. Net loss for 1938 applicable to Allegheny Ludlum Steel Corp. amounted to \$1,070,186.



The Gair-Lock Heavy Duty Face Mill illustrated above is just one of many Gair-Lock tools that are reducing the metal cutting costs in the production industries.

The Gair-Lock all-purpose blades shown in this mill are applicable to all types of cutting tools from single point boring bars to complicated milling cutters -- and they save money wherever used. Write for Gair-Lock folder No. 401.

**The Gairing Tool Co., Detroit, Mich.  
In Canada - Galt, Ontario**

**Gairing  
Lock**

**SPECIALISTS IN FINE CUTTING  
TOOLS FOR 21 YEARS**

### New Union Advertises to Win Members at Gary

**L**EADERS of an independent union of workers in American Bridge Co., which is a U. S. Steel Corp. subsidiary holding a labor contract with John L. Lewis' SWOC, have opened a newspaper advertising campaign in Gary, Ind.

Intended to "exclude all outside influences and professional organizers," the Employees Bargaining and Benefit Association, headed by G. B. Rothrock and G. E. Lee, declare that its bargaining rights are equal to those of any other union and offer, for monthly dues of \$1, the following benefits:

"(1) The right to be represented in a grievance by our bargaining committee; (2) sickness and accident benefits of \$12 per week, with a maximum of \$156; (3) hospitalization benefits of \$14 per week with \$16 for special expenses, with a maximum of \$75; (4) death benefit of \$100."

### Lower Truck Rates on Steel Products Suspended

**W**ASHINGTON—The Interstate Commerce Commission on Tuesday suspended until July 4 motor truck schedules proposing reduced rates on iron and steel products between points in central territory. Illustrative of the schedules is the proposal to reduce from 29c. to 28c. per 100 lb. the rate from Rock Island, Ill., to Fort Wayne, Ind.

### 1000 Pratt & Whitney Engines for France

**O**NE thousand airplane engines, valued at \$14,000,000, have been ordered from the Pratt & Whitney division of United Aircraft Corp. by the French government, with approval of the War Department at Washington.

## Open Hearth Group To Meet in Cleveland

THE National Open Hearth Committee will hold its annual conference in the Cleveland Hotel, Cleveland, on April 26, 27 and 28. At the same time and place the Blast Furnace and Raw Materials Committee of the American Institute of Mining and Metallurgical Engineers will hold a meeting.

Five technical sessions will be held during the conference, and three sessions will be held by the blast furnace group. The first open hearth session on the morning of April 26 will deal with a question which is of vital interest to all operators at this time, namely: "Employer - Employee Relations in the Steel Plant." At their first session during the morning of April 26, the blast furnace group will discuss the effect of solution loss reactions on blast furnace economy, and effects of low slag volume on cost and quality.

At noon both committees will attend a welcoming luncheon. Harold Burton, mayor of Cleveland, and D. B. Gillies, president of the American Institute of Mining and Metallurgical Engineers, will address the group.

The open hearth men will discuss the use of refractories during the afternoon session on Wednesday. Invitations have been sent to members of the Refractory Division of the American Ceramic Society to take part in these discussions. Gilbert Soler, research manager, Timken Roller Bearing Co., will act as chairman. Some of the subjects for discussion are, (a) new ideas for the installation of furnace bottoms with particular reference to plastic chrome bottoms, (b) improvements in checker construction, (c) refractories for tap holes, runners, ladle accessories and hot tops, and (d) how can the open hearth operator be assured of uniform and satisfactory refractory material?

At the afternoon session the blast furnace men will hear about blast furnace practice in South Africa, and will discuss freight cost of iron ore, and a low temperature, vacuum process for iron ore reduction.

The Thursday morning conference will be devoted to a joint discussion by both committees of problems which are of vital interest and importance to both groups, as for instance, what the open hearth requires from a blast furnace; how open hearth requirements can be met; economical amount of open hearth slag used in a blast

furnace; use of mixer type ladles; substitution of blown metal; and effect of hot metal analysis and casting temperature on the quality of open hearth steel.

During the afternoon of April 27 the members and guests of the joint committees will visit the large, modern plant of the Republic Steel Corp. in Cleveland.

At 6:30 p. m. there will be a cocktail party in the Cleveland Hotel followed by the annual good fellowship

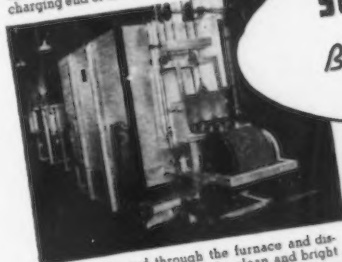
dinner at 7 p. m. Harry Sain, special representative of the Industrial Commission of the State of Ohio, will deliver a short, inspirational and humorous talk on the subject, "Safety in the Steel Plant."

Friday morning the open hearth group will discuss operations in the open hearth department. The following subjects will be discussed: (1) Description of a pilot open hearth furnace. (2) Construction and operation of a new furnace at the Pittsburgh



**you can join your metal parts  
ECONOMICALLY, NEATLY,  
SECURELY and CONTINUOUSLY  
By the ELECTRIC FURNACE BRAZING METHOD**

The assemblies are loaded on a conveyor at charging end of the furnace as shown below



...and carried through the furnace and discharged—securely joined—clean and bright



Small assemblies weighing only a fraction of an ounce as well as large intricate assemblies weighing several pounds are neatly and securely joined in numerous designs of continuous and batch type copper brazing furnaces—built by The Electric Furnace Co., Salem, Ohio.

Four E. F. brazing furnaces are shown on this page. The two pusher type furnaces above are brazing large automotive and refrigerator assemblies. The two belt conveyor furnaces at left are brazing automobile fan pulleys. Other E. F. brazing furnaces are handling practically everything from small metal radio tube parts up to large assemblies weighing 50 pounds or more.

Send for  
Circular  
on the  
Brazing Process.



Investigate the brazing process for your products. We will be glad to give you complete information, put samples of your products through one of these furnaces to show you the results you can expect, and give you an estimate on the cost of the equipment to handle your production, together with operating cost, etc.

**The Electric Furnace Co., Salem, Ohio**

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production

Steel Co. (3) Instrumentation on a modern open hearth furnace. (4) Pyrometers for metal bath temperatures. (5) Bottom pouring practice. (6) Crowe slag pockets. (7) Description of a novel design for an open hearth furnace without a front wall. (8) Use of light-weight scrap.

Friday afternoon the open hearth group will discuss quality problems connected with the manufacture of open hearth steel. Questions to be discussed include the effect of aluminum on grain size in killed steels, use of other deoxidizers on grain size, effect of patching furnace bottoms on grain size control, use of silico-manganese in forging and other steels, as well as the effect of mold design on the quality of killed steels.

A great many subjects coming under the classification of rimming steel will also be discussed. Some of these are: (a) Best FeO content of slag for rimming 0.20 per cent carbon steels. (b) Percentage of automobile scrap used in making extra deep drawing steels. (c) Effect of high and low residual manganese on rimming steels. (d) Best place for aluminum additions—in ladle or in molds. (e) What defects in finished steel can be traced back to open hearth practice.

## Turkey Cuts Tariff On Steel Sheets 5%

WASHINGTON—Tariff concessions amounting to 5 per cent below existing duties on galvanized iron and steel sheets exported to Turkey, valued at \$880,000 in 1937, have been granted in the latest reciprocal trade agreement to be approved. The United States supplies about 91 per cent of the Turkish imports on this item, which is identified on tariff schedules as "zinc-galvanized iron and steel sheets up to a thickness of 3 millimeters."

## SEC Studies Small Business Financial Needs

WASHINGTON—The Securities and Exchange Commission announced through the Temporary National Economic Committee that it had launched a fact-finding study of the needs of small and intermediate size businesses for new capital financing. The investigation, already under way in Omaha, Birmingham, and Fall River (Mass.), is regarded by some observers as designed to offset the unfavorable reaction from TNEC activities in recent weeks.

## CAST IRON PIPE

Bourne, Mass., has awarded 1500 tons of 6 to 12-in. pipe to Warren Foundry & Pipe Corp.

Boston has placed 3700 ft. of 20-in. Class C pipe with United States Pipe & Foundry Co.

Wellesley, Mass., has contracted with Warren Foundry & Pipe Corp. for its 1939 pipe requirements.

Newport, R. I., Water Commission, 5 West Marlborough Street, will close bids April 6 for approximately 500 tons of various sized pipe to apply to contract No. 3.

Treasury Department, Procurement office, Boston, has placed about 100 tons of 6 to 12-in. pipe for locations in Ipswich and Peabody, Mass., with Warren Foundry & Pipe Corp.

Newport, R. I., on contract No. 2 has awarded about one mile of 20-in. pipe to R. D. Wood & Co., and 250 tons of 6 to 16-in. pipe and fittings to Warren Foundry & Pipe Corp.

Mount Savage Water Co., Mount Savage, Md., has acquired water system formerly operated by Union Mining Co. of Allegany County, and plans extensions and improvements in pipe lines for service at Mount Savage, Locust Grove and vicinity, where franchises have been secured.

Dearborn, Mo., plans pipe lines for water system and other waterworks installation. Cost about \$37,000. Financing will be arranged through Federal aid. W. B. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are consulting engineers.

South Fallsburgh, N. Y., will take bids early in May for pipe lines for water system and other waterworks installation. Cost about \$120,000. Alexander Potter, 50 Church Street, New York, is consulting engineer.

General Purchasing Officer, Panama Canal, Washington, asks bids until April 11 for 1800 ft. of cast iron soil pipe and soil pipe fittings (Schedule 3438).

Stockville, Neb., plans pipe lines for water system and other waterworks installation, including pumping machinery and accessory equipment. Bond issue has been approved. Louis M. Hovey is village clerk in charge.

Oceanside, Cal., asks bids until April 10 for main pipe line from new water supply source at wells in Porteous district on San Luis Rey River to connection with city system, about four and one-half miles, consisting of 900 ft. of 14-in. and 700 ft. of 12-in. pipe for river crossing (Schedule 2), 4900 ft. of 18-in. cement-lined cast iron, with alternates on centrifugally cast reinforced-concrete and transite pipe, respectively (Schedule 3), 17,000 ft. of 14, 16 and 18-in. cement-lined cast iron, with alternates on two other types of pipes noted in previous schedule (Schedule 4); also for deep-well submersible turbine pumping unit, with valves, fittings, etc. (Schedule 6). Quinton, Code & Hill-Leeds & Barnard, Edison Building, Los Angeles, are consulting engineers.

Olympia, Wash., plans about 4150 ft. of 12-in., 9550 ft. of 10-in., 24,030 ft. of 8-in., 25,338 ft. of 6-in., 11,337 ft. of 4-in., and 2785 ft. of 2-in. for extensions and replacements in main water lines and distribution mains; also hydrants and other waterworks equipment. Financing in part will be arranged through Federal aid. C. H. Williams is city engineer.

Willamina, Ore., plans 8-in. main water line from city reservoir to site of new local

mill of Pacific Plywood Corp., for plant service. Cost close to \$30,000.

Issaquah, Wash., plans pipe lines for extensions in water system. Cost about \$20,000. Financing is being arranged through Federal aid.

Construction Quartermaster, Fort Lewis, Wash., opened bids April 4 on 3600 ft. of 12-in. pipe, 1800 ft. of 10-in., and miscellaneous fittings.

## ... PIPE LINES ...

Kentucky Natural Gas Corp., Vincennes, Ind., has acquired properties of Universal Gas Co., at Greencastle, Bloomington, Bedford, Columbus, Martinsville, Franklin, Seymour and neighboring communities in Indiana, and will operate in conjunction with natural gas systems at Vincennes and other points in State. Plans are under way for extensions and improvements in steel pipe lines and facilities to use natural gas from Russellville, Ill., gas field, where Kentucky company is securing supply and developing additional gas wells. Straight natural gas will be furnished at places noted in future, instead of mixed gas as supplied by Universal company in past. Control equipment and other operating facilities will be installed at different points for this purpose, with extensions and replacements in certain main pipe lines for higher pressures for natural gas transmission. Kentucky company has connection at Terre Haute, Ind., with main line of Panhandle Eastern Pipe Line Co., for reserve supply from Texas gas fields. H. A. Sproul is in charge of company operations at Vincennes and vicinity.

Quartermaster, Chanute Field, Rantoul, Ill., asks bids until April 10 for steel pipe; also for bushings, couplings, unions, pipe plugs, etc. (Circular 196-30).

Delcambre, La., closes bids April 11 for pipe lines for natural gas distribution and other equipment for local system. Randolph & Middleton, Inc., Citizens National Bank Building, Hammond, Ind., is consulting engineer.

Greensburg, Kan., plans pipe line system for gas distribution. Special election is being arranged to vote bond issue. W. L. Woods, mayor, is in charge.

Purchasing and Contracting Officer, District Quartermaster, CCC, Fort Hayes, Columbus, Ohio, asks bids until April 11 for 10,000 ft. of 2-in. galvanized steel pipe, 3000 ft. of 1½-in. similar pipe, and 3000 ft. of ¾-in. similar pipe (Circular 5502-71).

Ashland Oil & Refining Co., Ashland, Ky., is concluding negotiations for purchase of steel pipe line gathering system of Illinois Pipe Line Co., in Owensboro, Ky., oil field, serving group of about 2000 wells, and will make extensions in pipe lines for connection with its own system for crude oil transmission.

Southern California Gas Co., 810 South Flower Street, Los Angeles, plans extensions and replacements in pipe lines for gas transmission and distribution in different parts of system this year. Total fund of about \$4,300,000 has been authorized for general expansion and improvements during year, including plants, pipe lines and other operating structures and facilities.

Quartermaster, West Point, N. Y., closes bids April 10 for 640 ft. of 10-in. welded steel pipe, including fittings (Circular 955-61).

Meehanite Metal Corp., Pittsburgh, has granted the right to manufacture Meehanite Metal to the Lowes Foundry Co. of Lower Hutt, New Zealand, and Booth-MacDonald & Company, Ltd., of Christ-Church, Australia.



## REINFORCING STEEL

*... Awards of 5325 tons;  
7000 tons in new projects.*

### ATLANTIC STATES AWARDS

- 1200 Tons, Bob's Creek, Md., substructure, Potomac River bridge, to Carnegie-Illinois Steel Corp., Pittsburgh; through Merritt-Chapman & Scott Corp., New York.
- 500 Tons, Queens, N. Y., Cross Island Parkway, contract SC-39-5, to Seaboard Steel Products Co., New York; through National Excavation Co., New York.
- 400 Tons, New Haven, Conn., sewage disposal plant, to Concrete Steel Co., Boston.
- 315 Tons, Queens, N. Y., Cross Island Parkway, contract MC-39-7, to Igoo Bros., Newark; through Elmhurst Contracting Co., Elmhurst, N. Y.
- 310 Tons, New York, section of East River Drive, to Fireproof Products Co., New York; through Del Dalso Construction Co., New York.
- 175 Tons, W. New York, N. J., relief sewer, to Bethlehem Steel Co., Bethlehem, Pa., through Faltoute Iron & Steel Co.
- 150 Tons, Northampton, Mass., high school, to an unnamed bidder.
- 145 Tons, Weehawken, N. J., school, to Joseph T. Ryerson & Son, Inc., Jersey City; through Auf De Heide Co., West New York, N. J.
- 135 Tons, East Park, N. Y., school, to Ceco Steel Products Corp., Jersey City.
- 125 Tons, Brentwood, N. Y., Pilgrim State Hospital, to Bethlehem Steel Co.
- 110 Tons, Salem, N. J., building for Anchor Hocking Glass Co., to Bethlehem Steel Co., Bethlehem, Pa.

### CENTRAL AND WESTERN STATES

- 350 Tons, Ann Arbor, Mich., men's dormitories, University of Michigan, to Jones & Laughlin Steel Corp., Pittsburgh; through Taylor & Gaskin, Detroit.
- 340 Tons, Cleveland, WPA requirements; bids received March 24 and March 30, to Patterson-Leitch Co., Cleveland.
- 300 Tons, Columbus, Ohio, Ohio State University, men's dormitory, to Pollak Steel Co., Cincinnati, through Hausman Steel Co., Toledo.
- 250 Tons, Kremmling, Colo., Bureau of Reclamation (Invitation 46033-A), to Colorado Fuel & Iron Corp., Denver.
- 154 Tons, Columbus, Treasury Procurement Division, Inv. 4/7956, to Republic Steel Corp., Cleveland, through Patterson-Leitch, Cleveland.
- 130 Tons, Ann Arbor, Mich., health service building, to Truscon Steel Co., Youngstown.
- 123 Tons, Buena, Wash., Yakima project (Invitation 33842-A), to Bethlehem Steel Co., San Francisco.
- 100 Tons, Cincinnati, factory for Phillips Pump & Tank Co., Cincinnati, to Jones & Laughlin Steel Corp., Pittsburgh; Parkway Construction Co., Cincinnati, general contractor.

### PENDING REINFORCING BAR PROJECTS ATLANTIC STATES

- 4000 Tons, New York, contract No. 6, East River Drive, J. Rich Steers, Inc., New York, low on general contract (previously reported).
- 850 Tons, Johnstown, Pa., U. S. Engineers Office, flood control, Conemaugh River.
- 500 Tons, Providence, R. I., viaduct.
- 400 Tons, Washington, Rock Creek sewer.
- 250 Tons, Willowbrook, N. Y., infirmary buildings.
- 200 Tons, Syracuse, N. Y., housing project, blocks F. and G.
- 139 Tons, Maryland, State purchasing bureau, Invitation OS No. 12800.
- 125 Tons, Wareham, Mass., Tobey Hospital addition.
- 122 Tons, Baltimore, Treasury Department Procurement Division, Inv. WP-9-C-336.

### CENTRAL AND WESTERN STATES

- 2000 Tons or more, San Francisco, Rincon Hill post office; bids April 18.

- 280 Tons, Columbus, Ohio, Treasury Procurement Division, Invitation 4/7910; Builders Structural Steel Co., Cleveland, low bidder.
- 270 Tons, Lorain, Ohio, East 21st Street bridge, Contract No. 6; Great Lakes Dredge & Dock Co., low bidder.
- 264 Tons, Cleveland, WPA requirements; bids received March 31; Builders' Structural Steel Co., Cleveland, low bidder.
- 200 Tons, Chicago, Monroe Street garage.
- 183 Tons, Chicago, south side vocational school.
- 175 Tons, Lorain, Ohio, East Erie Street bridge, contract No. 4; Great Lakes Dredge & Dock Co., low bidder.

- 156 Tons, New Orleans, public school; bids taken April 3.
- 150 Tons, South Bend, Ind., dormitory.
- 140 Tons, Des Moines, Iowa, soy bean elevator.
- 135 Tons, Davenport, Iowa, elementary school.
- 130 Tons, Wellston, Mo., high school; bids taken April 4.
- 115 Tons, Bryan, Ohio, rail steel bars for sewage plant; Bever & Morris, general contractor.
- 112 Tons, Mansfield, Ohio, John Simpson Junior High School; William C. Hawkins, Cleveland, general contractor.
- 106 Tons, Davenport, Iowa, public school; bids April 3.

## Irvin Quits Post As Steel Vice Chairman

UNITED STATES STEEL CORP. produced less finished steel in 1938 than in 1902, the first full year of the company's history, Edward R. Stettinius, Jr., said this week at the annual meeting of U. S. Steel stockholders. Finishing capacity, he said, was 114 per cent above capacity in 1902.

"In addition to the important shrinkage in the volume of output which occurred in 1938, the realized prices of steel products during most of the year were lower than those which prevailed during 1937 the corporation chairman said. "These two central facts of volume contraction and price reduction constitute the underlying basis and explanation of the reduction of the past year with respect to the

corporation's sales, profits and employment."

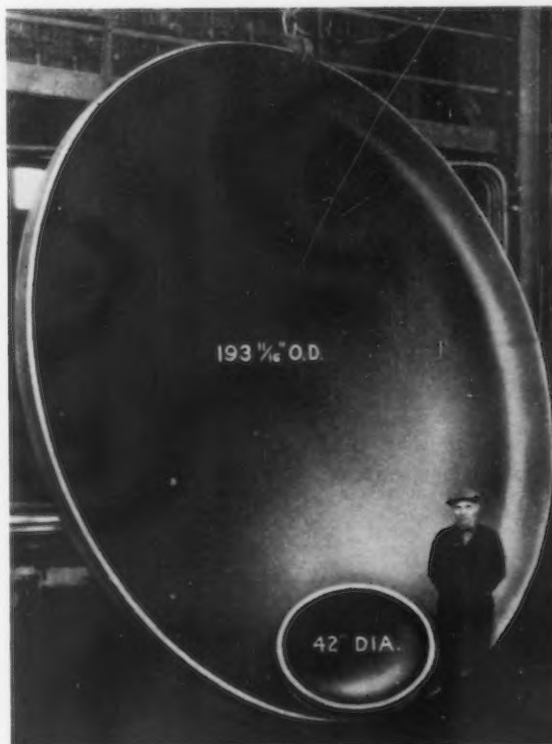
U. S. Steel's operations in the first quarter of 1939 averaged 52 per cent against the average of 36.2 per cent for all of 1938, Mr. Stettinius said.

At a meeting of the board of directors of the U. S. Steel, William A. Irvin, former president and recently vice-chairman, tendered his resignation in accordance with his expressed wish of last year. The office of vice-chairman was abolished, but Mr. Irvin will remain a member of the board of directors and of the finance committee. He has concluded 44 years of active service with the corporation.

ROBERT C. STANLEY, president of the International Nickel Co., who on Monday was elected a member of the board of directors at the stockholders' meeting, has been appointed a member of the finance committee, succeeding WALTER S. GIFFORD in that position as he has on the board.

## Flanged and Dished Head of Large Size

WORTH STEEL CO., Claymont, Del., recently turned out a flanged and dished head of unusual size. The finished size was 193 11/16 in., with a 3-in. straight flange, and 11 1/2-in. knuckle radius. The head was made from a plate 220 in. wide and 27/32 in. thick.



# March Daily Pig Iron

Up 5½%

**P**RODUCTION of coke pig iron in March on a daily basis continued the gain started in February, increasing 5½ per cent over that in February, or from 73,578 gross tons a day to 77,647 tons in March. Output totaled 2,407,058 tons, compared with 2,060,187 tons in February. The rate of operation was at 57 per cent of the industry's capacity as compared with a 54 per cent rate in February.

There were 123 furnaces in blast on April 1, operating at the rate of 77,860 tons a day, compared with 121 on March 1, producing at the rate of 74,285 tons daily. Six furnaces were blown in and four were blown out or banked. The United States Steel Corp. put in two furnaces and took one off blast. Independent producers blew in three units and took one out of production, and merchant producers blew one in and blew out or banked two units.

Among the furnaces blown in were the following: One Monongahela, National Tube Co.; one Gary, Carnegie-Illinois Steel Corp.; one Neville Island, Pittsburgh Coke & Iron Co.; one Haselton, one River, Republic Steel Corp.; and one Hubbard, Youngstown Sheet & Tube Co.

Furnaces blown out or banked included: Standish, Chateaugay Ore & Iron Co.; one Shenango Furnace Co. unit; one Steubenville, Wheeling Steel Corp.; and one Ensley, Tennessee Coal, Iron & Railroad Co.

## Production by Districts and Coke Furnaces in Blast

FURNACES	Production (Gross Tons)		April 1		March 1	
	March 31 Days	February 28 Days	Number in Blast	Operating Rate, Tons a Day	Number in Blast	Operating Rate, Tons a Day
<b>New York:</b>						
Buffalo .....	140,266	126,719	8	4,525	8	4,295
Other New York and Mass. ....	5,186	4,532	0	.....	1	165
<b>Pennsylvania:</b>						
Lehigh Valley .....	60,640	53,824	4	1,955	4	1,920
Spiegeleisen .....	4,473	1,643	1	145	1	90
Schuylkill Valley .....	17,557	17,152	1	565	1	615
Susquehanna and Lebanon Valleys .....	17,121	13,821	1	550	1	495
Pittsburgh District .....	477,718	368,264	22	15,990	19	13,760
Ferro. and Spiegel .....	6,146	10,154	1	200	2	365
Shenango Valley .....	24,016	33,418	1	725	2	1,195
Western Pennsylvania .....	54,677	50,486	3	1,765	3	1,805
Ferro. and Spiegel .....	6,675	5,562	1	215	1	200
Maryland .....	125,950	105,274	4	4,065	4	3,760
Wheeling District .....	124,011	117,527	5	3,480	6	4,195
<b>Ohio:</b>						
Mahoning Valley .....	226,923	201,608	11	7,890	9	6,805
Central and Northern .....	223,162	195,496	12	7,410	11	6,980
Southern .....	52,630	42,526	5	1,700	5	1,620
Illinois and Indiana .....	458,592	368,238	19	14,795	18	13,970
Michigan and Minnesota .....	88,637	78,871	5	2,860	5	2,815
Colorado, Missouri and Utah .....	43,322	28,932	3	1,395	3	1,145
<b>The South:</b>						
Virginia .....	.....	.....	0	.....	0	.....
Ferromanganese .....	3,187	2,939	1	105	1	105
Kentucky .....	13,913	10,314	1	450	1	370
Alabama .....	232,256	222,837	14	7,075	15	7,715
Tennessee .....	.....	.....	0	.....	0	.....
<b>Total .....</b>	<b>2,407,058</b>	<b>2,060,187</b>	<b>123</b>	<b>77,860</b>	<b>121</b>	<b>74,285</b>

## Production of Coke Pig Iron and Ferromanganese

	Gross Tons		Ferromanganese	
	Pig Iron*		1939	1938
January .....	1939	1938	20,805	22,388
February .....	2,175,423	1,429,085	18,655	20,205
March .....	2,060,187	1,298,268	16,008	21,194
April .....	2,407,058	1,452,487	.....	18,607
May .....	.....	1,376,141	.....	13,341
June .....	.....	1,255,024	.....	14,546
½ year .....	.....	1,062,021	.....	110,281
July .....	.....	7,873,026	.....	20,818
August .....	.....	1,201,785	.....	6,088
September .....	.....	1,493,995	.....	630
October .....	.....	1,680,435	.....	3,621
November .....	.....	2,052,284	.....	13,156
December .....	.....	2,269,983	.....	19,197
Year .....	.....	2,210,728	.....	173,791
	.....	18,782,236	.....	.....

\*These totals do not include charcoal pig iron.  
†Included in pig iron figures.

## Merchant Iron Made, Daily Rate

	Tons				
	1939	1938	1937	1936	1935
January .....	10,603	10,635	16,106	10,537	3,926
February .....	9,637	8,854	16,514	11,296	6,288
March .....	8,951	8,524	16,457	10,831	7,089
April .....	.....	8,273	14,517	13,897	8,799
May .....	.....	6,431	19,483	12,814	8,441
June .....	.....	5,375	15,870	14,209	7,874
July .....	.....	5,495	19,609	11,619	8,644
August .....	.....	6,614	17,831	12,148	8,194
September .....	.....	11,205	20,065	12,526	10,090
October .....	.....	10,799	18,950	13,645	11,199
November .....	.....	13,208	15,662	14,739	12,503
December .....	.....	9,130	10,964	14,852	13,312

## Daily Average Production of Coke Pig Iron

	Gross Tons				
	1939	1938	1937	1936	1935
January .....	70,175	46,100	103,597	65,351	47,656
February .....	73,578	46,367	107,115	62,886	57,448
March .....	77,647	46,854	111,596	65,816	57,098
April .....	.....	45,871	113,055	80,125	55,449
May .....	.....	40,485	114,104	85,432	55,713
June .....	.....	35,400	103,584	86,208	51,570
½ year .....	.....	43,497	108,876	74,331	54,138
July .....	.....	38,767	112,866	83,686	49,041
August .....	.....	48,193	116,317	87,475	56,816
September .....	.....	56,015	113,679	91,010	59,216
October .....	.....	66,203	93,311	96,512	63,820
November .....	.....	75,666	66,891	98,246	68,864
December .....	.....	71,314	48,075	100,485	67,950
Year .....	.....	51,458	100,305	83,658	67,556

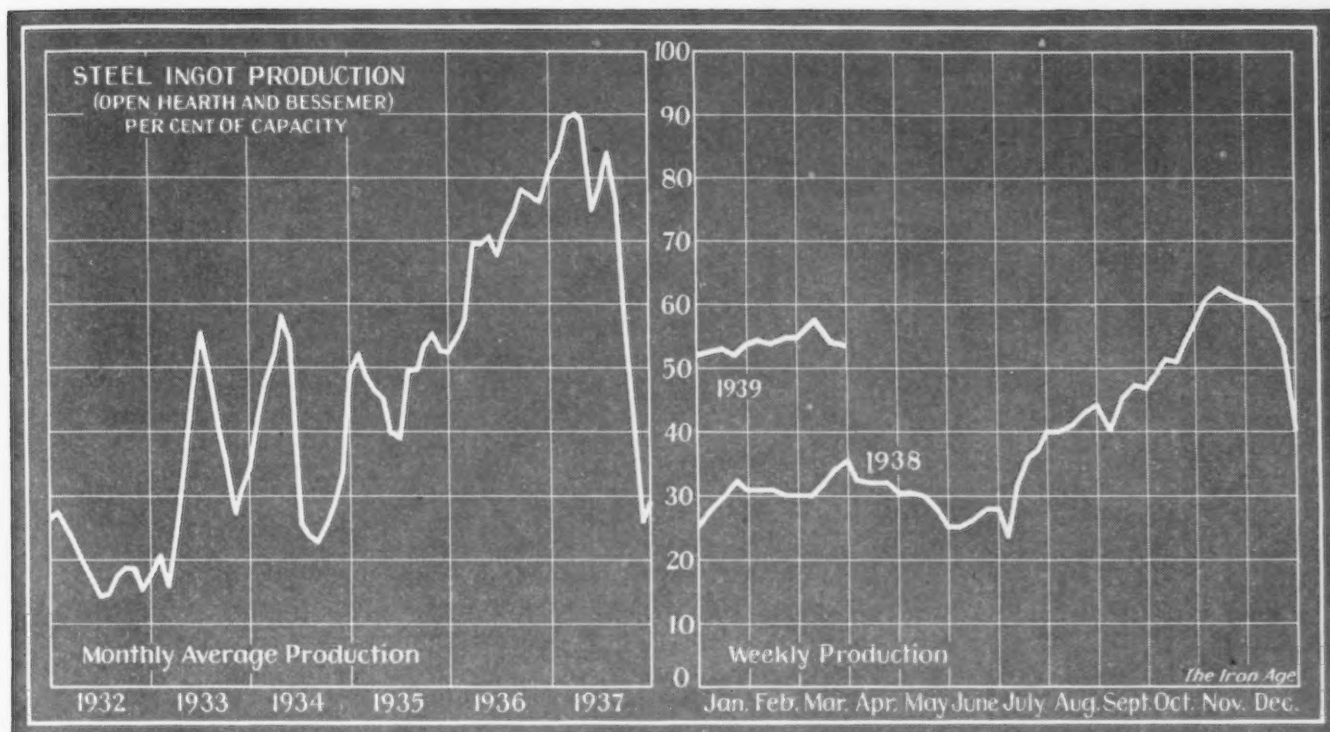
## Court Studies Steel Wage Order Appeal

**W**ASHINGTON—After hearing three hours of oral argument from counsel representing seven eastern iron and steel producers and attorneys for the Government, the District of Columbia Court of Appeals took under advisement on Tuesday the question of making permanent the temporary injunction under which the Secretary of Labor has been prevented from continuing in effect her minimum steel wage determination.

Twelve additional steel companies operating in various sections of the country, plus ten firms represented by the Rail Steel Bar Association, filed as friends of the court a brief in which they concurred with the views expressed by counsel for the eastern mills, pointing out that the entire industry is vitally concerned over the outcome of the case.

April 11 was expected to be the earliest possible decision date. Each side was given one week in which to file briefs with the court.

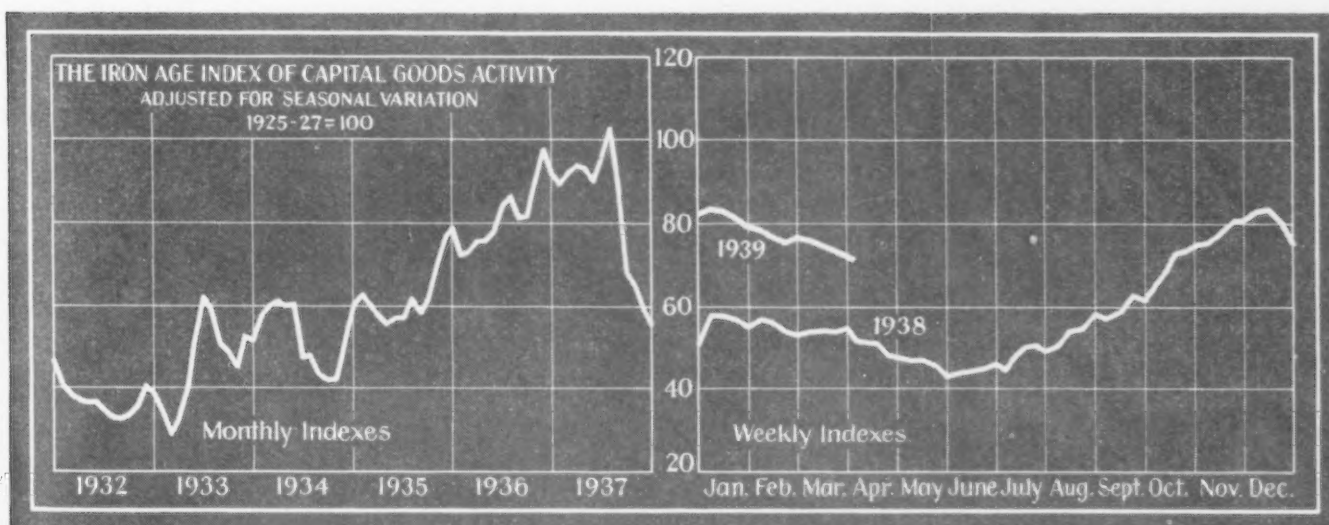
# Ingot Output Declines a Half Point to 54½ Per Cent



District Ingot Production, Per Cent of Capacity	CURRENT WEEK	PREVIOUS WEEK	Pitts- burgh	Chicago	Valleys	Phila- delphia	Cleve- land	Buffalo	Wheel- ing	Detroit	Southern	S. Ohio River	Western St. Louis	East- ern	Aggre- gate
	48.0	52.0	53.5	53.5	52.0	38.0	53.0	41.5	76.0	73.0	50.5	55.5	60.0	43.0	54.5
					51.0	38.0	53.0	36.5	76.0	71.5*	60.5	55.5	60.0	45.0	55.0

\* Revised.

## Capital Goods Index Declines Again



THE IRON AGE index of capital goods activity eased 1.1 point to 72.1 in the past week, bringing it down to the lowest level touched since the week ended Oct. 15, 1938. This latest loss, the fourth consecutive one, was due not so much to pronounced drops in the physical output of the heavy industries represented in the index, as it was to failure of production to improve in keeping with seasonal trends. This was particularly true of the automobile series, where a nominal loss in output in the week, when adjusted against a rising trend, resulted in a loss of six points in its index position. The only component of the index to show a gain for the week was the lumber carloading series. This factor, which represents activity

in the construction and repair of wood buildings, rose 3.4 points to 50.9.

	Week Ended Apr. 1	Week Ended Mar. 25	Comparable Week	
			1938	1929
Steel Ingot production <sup>1</sup> . . . . .	71.0	71.3	45.9	121.3
Automobile production <sup>2</sup> . . . . .	76.3	82.3	49.6	126.8
Construction contracts <sup>3</sup> . . . . .	90.1	91.4	73.5	142.9
Forest products carloadings <sup>4</sup> . . . . .	50.9	47.5	49.6	126.3
Production and shipments, Pittsburgh District <sup>5</sup> . . . . .	72.3	73.4	53.4	117.4
Combined index . . . . .	72.1	73.2	54.4	126.9

Sources: 1. THE IRON AGE; 2. Ward's Automotive Reports; 3. Engineering News-Record; 4. Association of American Railroads; 5. University of Pittsburgh.



# ... SUMMARY OF THE WEEK ...

*... Automobile schedules sharply reduced; sales lower.*

° ° °

*... Ingot output off slightly; new buying of steel lags.*

° ° °

*... Pig iron output higher in February; scrap weaker.*

THE crisis in Europe, the failure of the Washington Administration to adopt a constructive policy toward business, weakness in the stock market and even the weather are blamed for the apparent halting of improvement in steel and related lines.

Automobile manufacturers are inclined to attribute the slump in retail sales of cars during the past two or three weeks partly to a cold and rainy spring, although other factors are not ignored. The most discouraging feature of the week's business news is a sharp reduction in automobile schedules, indicating that April assemblies may be well below those of March, whereas in every year of the past decade, except 1938, April production has exceeded that of March, sometimes by substantial margins. Last week's assemblies showed a small drop, but there will undoubtedly be a larger one this week as some plants, which only recently went on a five-day week, have dropped back to three or four-day schedules.

Steel business generally has not declined seriously, but there has been a noticeable lag in the past week. Although March volume adhered quite closely to the pace of February, it was below expectations and insufficient to maintain recent schedules, which were supported partly by backlogs, now diminishing. Although the ingot rate for the entire industry is estimated to be only a half a point lower this week at 54½ per cent, there has been a drop of four points in the Pittsburgh district to 48 per cent, and the Birmingham district, where for five weeks prior to last week there were steady operations of about 72 per cent, is now down close to 50 per cent. Completion of some rail orders booked early in the year may be the explanation for this drop.

UNCERTAINTY as to the steel outlook for the immediate future has extended to the scrap markets, which are unsettled, though not many price declines have occurred. However, the Pitts-

burgh market is quotably lower at \$15.50 to \$16, bringing about a slight downward revision in THE IRON AGE scrap composite price to \$15.25 against \$15.29 last week.

Pig iron production in March gained 5½ per cent over that of February reckoned on a daily basis of 77,647 gross tons last month against 73,578 tons in February. The March total was 2,407,058 tons compared with 2,060,187 tons in February. The rate of operations last month was 57 per cent against 54 per cent in February. There were 123 furnaces in blast on April 1, a gain of two. United States Steel Corp. made a net gain of one, the independents gained two and merchant units in blast were one less. The furnaces in blast on April 1 were operating at a daily rate of 77,860 tons.

Complete figures on ingot production in the first quarter, which will be available within a few days, will reveal a total output slightly less than that of the fourth quarter of last year. The general expectation of the trade early in the year was that there would be a moderate gain. The failure of private work to go ahead in the volume that was hoped for again calls attention to the fact that the steel industry cannot thrive alone on Government spending, which last year accounted for less than 5 per cent of total steel orders placed direct with the mills.

STRUCTURAL steel contracts do not yet begin to reflect the vast sums set aside for PWA work. This week's lettings are not quite 21,000 tons and new work out for bids is about 15,500 tons. A bridge over the Potomac River accounts for 9300 tons of shapes, 1600 tons of plates and 1200 tons of bars. Public work continues to predominate in awards and inquiries for construction steel. A 360-mile pipe line which may be built by an oil company from Illinois to Ohio would take about 38,000 tons of pipe.

Railroad orders have been a little better in the past week after a lull. The Santa Fe has placed 55,000 tons of rails, the Chicago & North Western, 9600 tons, the Chicago, St. Paul, Minneapolis & Omaha, 3000 tons, the Bangor & Aroostook, 2551 tons and the Boston Elevated, 1325 tons. The Southern Pacific has ordered two streamlined trains of 28 cars, costing about \$2,000,000, and the Chicago, Rock Island & Pacific has been authorized to buy two streamlined trains.

THE shutdown of bituminous coal mines pending settlement of differences between operators and the unions is not yet a market factor since steel companies have sufficient coal above ground for several weeks. It is believed that a solution will be found before a coal shortage develops.

# A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous  
Advances Over Past Week in Heavy Type, Declines in Italics

## Rails and Semi-finished Steel

Per Gross Ton:	Apr. 4, 1939	Mar. 28, 1939	Mar. 7, 1939	Apr. 5, *1938
Rails, heavy, at mill .....	\$40.00	\$40.00	\$40.00	\$42.50
Light rails: Pittsburgh, Chi- cago, Birmingham .....	40.00	40.00	40.00	43.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Bir- mingham, Sparrows Point..	34.00	34.00	34.00	37.00
Sheet bars: Pittsburgh, Chi- cago, Cleveland, Youngs- town, Buffalo, Canton, Spar- rows Point .....	34.00	34.00	34.00	37.00
Slabs: (Pittsburgh, Chicago, Gary, Cleveland, Youngs- town, Buffalo, Birmingham, Sparrows Point .....	34.00	34.00	34.00	37.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Bir- mingham .....	40.00	40.00	40.00	43.00
Wire rods: Nos. 4 and 5, Pittsburgh, Chicago, Cleve- land .....	43.00	43.00	43.00	47.00
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb. ....	1.90	1.90	1.90	2.10

## Finished Steel

Cents Per Lb.:				
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham .....	2.25	2.25	2.25	2.45
Plates: Pittsburgh, Chicago, Gary, Birmingham, Spar- rows Point, Cleveland, Youngstown, Coatesville, Claymont .....	2.10	2.10	2.10	2.25
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham ..	2.10	2.10	2.10	2.25
Cold finished bars: Pitts- burgh, Buffalo, Cleveland, Chicago, Gary .....	2.70	2.70	2.70	2.90
Alloy bars: Pittsburgh, Chi- cago, Buffalo, Bethlehem, Massillon or Canton .....	2.80	2.80	2.80	3.00
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham .....	2.15	2.15	2.15	2.40
Cold rolled strip: Pittsburgh, Cleveland, Youngstown ...	2.95	2.95	2.95	3.20
Sheets, galv., No. 24: Pitts- burgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham ..	3.50	3.50	3.50	3.80
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown..	2.15	2.15	2.15	...
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown ...	3.20	3.20	3.20	...

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

## Cents Per Lb.:

	Apr. 4, 1939	Mar. 28, 1939	Mar. 7, 1939	Apr. 5, *1938
Wire nails: Pittsburgh, Chi- cago, Cleveland, Birming- ham .....	2.45	2.45	2.45	2.75
Plain wire: Pittsburgh, Chi- cago, Cleveland, Birming- ham .....	2.60	2.60	2.60	2.90
Barbed wire, galv.: Pitts- burgh, Chicago, Cleveland, Birmingham .....	†3.30	3.30	3.30	3.40
Tin plate, 100 lb. base box: Pittsburgh and Gary .....	\$5.00	\$5.00	\$5.00	†\$5.35

\*Pittsburgh prices only.  
†Applies to 80-rod spools only.  
‡Subject to post-season adjustment.

## Pig Iron

Per Gross Ton:				
No. 2 fdy., Philadelphia .....	\$22.84	\$22.84	\$22.84	\$25.84
No. 2, Valley furnace .....	21.00	21.00	21.00	24.00
No. 2, Southern Cn'tl .....	21.06	21.06	21.06	23.89
No. 2, Birmingham .....	17.38	17.38	17.38	20.38
No. 2, foundry, Chicago† .....	21.00	21.00	21.00	24.00
Basic, del'd eastern Pa. ....	22.34	22.34	22.34	25.34
Basic, Valley furnace .....	20.50	20.50	20.50	23.50
Malleable, Chicago† .....	21.00	21.00	21.00	24.00
Malleable, Valley .....	21.00	21.00	21.00	24.00
L. S. charcoal, Chicago .....	28.34	28.34	28.34	30.24
Ferromanganese, seab'd car- lots .....	80.00	80.00	80.00	102.50

†The switching charge for delivery to foundries in the Chi-  
cago district is 60c. per ton.

## Scrap

Per Gross Ton:				
Heavy melting steel, P'gh... \$15.75	\$15.75	\$15.875	\$16.00	\$13.00
Heavy melting steel, Phila... 15.75	15.75	15.75	15.25	13.75
Heavy melting steel, Ch'go... 14.25	14.25	14.25	14.25	11.75
Carwheels, Chicago .....	13.00	13.00	13.00	13.50
Carwheels, Philadelphia .....	16.75	16.75	16.75	15.75
No. 1 cast, Pittsburgh .....	15.50	15.50	15.50	14.75
No. 1 cast, Philadelphia .....	16.75	16.75	16.75	15.75
No. 1 cast, Ch'go (net ton) ..	12.75	12.75	12.75	11.25

## Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt .....	\$3.75	\$3.75	\$3.75	\$4.00
Foundry coke, prompt .....	4.75	4.75	4.75	5.00

## Non-Ferrous Metals

Cents per Lb. to Large Buyers:				
Copper, electrolytic, Conn... 11.00	11.00	11.25	11.25	10.00
Copper, lake, New York .... 11.375	11.375	11.375	11.375	10.125
Tin (Straits), New York .... 46.17	46.17	46.50	46.00	38.10
Zinc, East St. Louis .....	4.50	4.50	4.50	4.15
Zinc, New York .....	4.89	4.89	4.89	4.54
Lead, St. Louis .....	4.70	4.70	4.60	4.35
Lead, New York .....	4.85	4.85	4.75	4.50
Antimony (Asiatic), N. Y.... 14.00	14.00	14.00	14.00	15.75

# The Iron Age Composite Prices

## Finished Steel

April 4, 1939  
One week ago  
One month ago  
One year ago

2.286c. a Lb.	
2.286	
2.286	
2.512	

Based on steel bars, beams,  
tank plates, wire, rails, black  
pipe, sheets and hot-rolled strip.  
These products represent 85 per  
cent of the United States output.

HIGH	LOW
1939.....	2.512c., May 17; 2.211c., Oct. 18
1938.....	2.512c., Mar. 9; 2.249c., Jan. 4
1937.....	2.249c., Dec. 23; 2.016c., Mar. 10
1936.....	2.062c., Oct. 1; 2.056c., Jan. 8
1935.....	2.118c., Apr. 24; 1.945c., Jan. 2
1934.....	1.953c., Oct. 3; 1.792c., May 2
1933.....	1.915c., Sept. 6; 1.870c., Mar. 15
1932.....	1.981c., Jan. 13; 1.883c., Dec. 29
1931.....	2.192c., Jan. 7; 1.962c., Dec. 9
1930.....	2.223c., Apr. 2; 2.192c., Oct. 29
1929.....	2.192c., Dec. 11; 2.142c., July 10
1928.....	

## Pig Iron

\$20.61 a Gross Ton  
20.61  
20.61  
23.25

Based on average for basic  
iron at Valley furnace and found-  
ry iron at Chicago, Philadel-  
phia, Buffalo, Valley and South-  
ern iron at Cincinnati.

HIGH	LOW
\$23.25, June 21; \$19.61, July 6	
23.25, Mar. 9; 20.25, Feb. 16	
19.73, Nov. 24; 18.73, Aug. 11	
18.84, Nov. 5; 17.83, May 14	
17.90, May 1; 16.90, Jan. 27	
16.90, Dec. 5; 13.56, Jan. 3	
14.81, Jan. 5; 13.56, Dec. 6	
15.90, Jan. 6; 14.79, Dec. 15	
18.21, Jan. 7; 15.90, Dec. 16	
18.71, May 14; 18.21, Dec. 17	
18.59, Nov. 27; 17.04, July 24	

## Steel Scrap

\$15.25 a Gross Ton  
15.29  
15.17  
12.83

Based on No. 1 heavy melting  
steel quotations at Pittsburgh,  
Philadelphia and Chicago.

HIGH	LOW
\$15.29, Mar. 28; \$14.875, Jan. 31	
15.00, Nov. 22; 11.00, June 7	
21.92, Mar. 30; 12.92, Nov. 10	
17.75, Dec. 21; 12.67, June 9	
13.42, Dec. 10; 10.33, Apr. 29	
13.00, Mar. 13; 9.50, Sept. 25	
12.25, Aug. 8; 6.75, Jan. 3	
8.50, Jan. 12; 6.43, July 5	
11.33, Jan. 6; 8.50, Dec. 29	
15.00, Feb. 18; 11.25, Dec. 9	
17.58, Jan. 29; 14.08, Dec. 3	
16.50, Dec. 31; 13.08, July 9	

# ... THIS WEEK'S MARKET NEWS ...

## STEEL OPERATIONS

*... Pittsburgh down four points to 48% ... Industry off slightly*

THE steel ingot rate for the entire industry is a half point lower this week at 54½ per cent. The sharpest loss is in the PITTSBURGH district, where production has declined four points to 48 per cent, chiefly because of reduction in backlogs and insufficiency of new business to support previous operating rates. There has been a further reduction also in the SOUTH, where the rate is now barely more than 50 per cent against a rate of 72 per cent that was steadily maintained for five weeks prior to last week.

There have been gains in operations at YOUNGSTOWN and at BUFFALO, but not enough to offset declines elsewhere. The CHICAGO rate is maintained at 53½ per cent.

In DETROIT operations are somewhat erratic. Last week the major producer there operated a varying number of open hearths. The rate in effect at the beginning of the week led to an estimate of 62½ per cent for the district, but recapitulation at the end of the week showed that operations had come close to 71½ per cent. This week the Great Lakes Steel Corp. is operating 12 open hearths and Ford Motor Co. six, but it is admitted that the rate may be lower before the end of the week if the automobile industry continues its hesitant gait.

## PRICES

*... Test of new quantity deductions may come this month*

THIS month should see a substantial test of current steel prices, especially those involving flat rolled products, and more specifically, recently revised quantity deduction setups. There is a likelihood that some producers will throw overboard the theoretical weight method of selling sheets which was inaugurated some time ago at the insistence of automobile companies, and revert to the former method of billing customers for the actual amount of steel on each shipment. A move toward this action has already been made but realization of the change is not likely to occur much before the first of next month.

There was an interesting test of prices in the bids on 750 tons of hot rolled annealed sheets for license plates for the State of Massachusetts. Deliveries are required beginning in July, extending to the end of June, 1940, a shipment of 50 tons to be made every 25 days. Some companies declined to bid on deliveries beyond Dec. 31; some offered a deduction of 10c. per 100 lb. on the quantity, others 15c. Some added no extra for shearing. Award was made to a Boston jobber on the basis of the lowest combined bid over the full delivery period.

The only price change reported this week is an advance of \$2 a ton on wire building fabric.

## NEW BUSINESS

*... Buying is in fair volume ... April outlook uncertain*

TOTAL steel bookings at PITTSBURGH in the past week were only a shade greater than in the week before. However, discounting the lack of rail tonnage recently, since the majority of this business for 1939 has already been placed, activity in other steel products compares favorably with levels of a few weeks ago. In some cases demand is actually better. Although total tonnages are not large, there continues to be a noticeable increase in the number of customers ordering steel, which fully substantiates recent statements to the effect that diversification is slowly expanding.

At CLEVELAND and YOUNGSTOWN, where aggregate new business of steel mills for March slightly exceeded February volume due to the longer month, the probable course of activity for the balance of the spring and early summer is expected to be determined within a very short time. There are also a number of bright spots, but the total volume of this business is not large enough to offset inactivity among some industries. Manufacturers of electric motors, requiring electrical sheets, are very active. Bus and truck manufacturers are ordering freely. About 12,000 tons of steel rails may be placed soon at CLEVELAND.

In the CHICAGO area future prospects for the steel industry are not especially bright. Few doubt that current operations will be exceeded somewhat at times during the spring, but no important tonnages are believed

to be forthcoming that would support higher operations for a sustained period. In most CHICAGO sales offices the daily order average during March was behind that of February, though the total for the month was slightly better in some instances. Activity during March, on the whole, was disappointing to the trade here as many were expecting a definitely improved month. Fear, inspired by the European war scare and domestic political situations, is blamed for the showing.

CHICAGO mills still are hopeful of additional buys from DETROIT on 1939 cars. The agricultural machinery picture is somewhat favorable. January farm income in eight North Central and Midwest states exceeded that of a year ago by 24 per cent, while in the 40 remaining states income dropped 12 per cent. Farm income usually declines seasonally through April 1. More than the usual seasonal recovery after this time will depend on the course of industrial employment and consumers' incomes. Tractor plants, both farm and industrial, continue busy. The CHICAGO construction industry appears to be in for a busy spring and summer. Manufacturers of household utilities through the Middle West are fairly busy, notably washing machines.

## PIG IRON

*... Shipments in March about equal to those of February*

PIG iron shipments in March were about on a level with those of February, making allowance for the greater number of business days last month. New buying is in small volume. A good many foundries which regularly make commitments for quarterly periods have done so for the second quarter. The volume of spot buying in most districts is negligible.

Production figures for March are published elsewhere in this issue.

## PLATES

*... Sales gain has been less than expected*

WHILE sales of plates ran heavier in March than February, the gain for most producers was less than had been expected in view of the contracts placed during recent months for construction work and railroad equipment. Some mills estimate a gain



of about 20 per cent last month over the preceding month.

One of the largest awards of the week was 2213 tons for a municipal intake line at Toledo, which went to the Bethlehem Steel Co.

In the East, sales are spotty. The American Locomotive Co. has placed orders for the several hundred tons required for 15 locomotives to be built for the Union Pacific.

At CHICAGO, it is expected that material required for railroad equipment will be one of the main supports of the market in the next few months.

Lima Locomotive Co., Lima, Ohio, has ordered 600 tons of steel, mostly plates, for locomotive orders recently received.

## SEMI-FINISHED STEEL

... Volume of demand shows no change

SEMI-FINISHED steel demand at PITTSBURGH is virtually unchanged from a week ago. Producers expect sporadic changes in requirements because of the low point of consumers' stocks. Movement of tin bars to non-integrated mills continues fairly brisk with further increases anticipated.

Orders and shipment of CLEVELAND and YOUNGSTOWN producers during March suffered slightly in comparison with February.

## REINFORCING BARS

... Activity in fairly good volume

REINFORCING bar specifications at PITTSBURGH during March increased somewhat from February, while shipments made even a better showing. New business during the past week has been holding at recent levels and producers continue optimistic with respect to future demand. Both inquiries and awards have been improving and some fair-sized jobs are expected to be let soon.

CHICAGO awards reported this week are few, but work in prospect is considerable. Two sections of the CHICAGO subway, involving over 5000 tons of bars, should be awarded within two weeks.

SAN FRANCISCO's all-concrete Rincon Hill post office, for which bids are asked April 18, will require over 2000 tons of reinforcing steel, according to preliminary takeoffs. Bethlehem

## Market Sidelights

Shippers' Advisory Boards over the country have estimated increased carloadings in the second quarter of 1939 as compared with the same period last year, of 72.4 per cent in ore and concentrates, 59.4 per cent in automobiles, trucks and parts, and 45 per cent in iron and steel. A decrease of 18.2 per cent is expected in loadings of agricultural implements and vehicles other than automobiles. Estimated loadings for all products are expected to be 12.6 per cent above actual loadings in the second quarter of 1938.

\* \* \*

Approximately 10,000 tons of plain steel will be required for the aircraft carrier *Hornet*, contract for which has just been awarded the Newport News (Va.) Shipbuilding & Drydock Co. The ship will cost \$31,800,000.

\* \* \*

Steel companies are not much worried about the shutdown in the coal mines since there are sufficient stocks above ground to last several weeks. Meanwhile, both commercial and captive mines are shut down in the Pittsburgh area, with the exception of maintenance crews. It is expected that some sort of a solution will be forthcoming before the lack of coal becomes a serious market factor. Some sources believe, however, that operators have lost so much money recently that they will hold out for what they feel to be a just adjudication of the present problem.

Steel Co., San Francisco, is low bidder on 2217 tons for Grand Coulee Dam.

The largest award of the week was 1200 tons for a Potomac River bridge at Bob's Creek, Md., which also takes a large tonnage of structural steel.

## STRUCTURAL STEEL

... 9300-Ton bridge contract goes to Carnegie-Illinois

CARNEGIE-ILLINOIS STEEL CORP., through Merritt-Chapman & Scott, has been awarded 9300 tons for the substructure of the Potomac River bridge at Bob's Creek, Md., the largest job of a quiet week. Structural specifications at PITTSBURGH and some other points are steady and are furnishing moderate support to current operating rates. While some fabricators are mildly

pessimistic concerning future business, some comfort is taken from a mild increase in the number of privately financed projects.

Pending projects include 4000 tons for the East 21st Street bridge at Lorain, Ohio, while state buildings at Brentwood, N. Y., will require 4600 tons. The Belmont Iron Works, Philadelphia, will provide 1000 tons for Willowbrook, N. Y., infirmary buildings. On the WEST COAST the Bureau of Reclamation has asked bids April 21 on two bridges for the Central Valley project, California.

Shipments of structural steel in February totaled 76,924 tons, as compared with 91,141 tons in the preceding month and 81,161 tons in February, 1938, according to the American Institute of Steel Construction. Shipments in the first two months of the present year amount to 168,065 against 168,924 in comparable period of 1938. New orders booked in February were 77,036 tons against 101,559 in January and 57,144 in February a year ago. Total for the first two months of 1939 is 178,595 as compared with 137,464 in corresponding period of 1938. Drop in bookings is traced to delay in closing outstanding public works contracts already financed.

## SHEETS AND STRIP

... March sales not up to expectations

SHEET orders at PITTSBURGH reflect a mild increase from a week ago, due in some measure to a better diversification in miscellaneous demand. Home appliance manufacturers are a shade more active and export buying has been a factor recently. At least one or two final buys in the automobile industry are expected this month. Prices continue firm but most sources agree that the real test of current quotations will come this month.

Tonnage received by mills at CLEVELAND and YOUNGSTOWN during March fell short of expectations and failed to exceed February volume. Sales of galvanized sheets proved good. Manufacturers of electric motors, requiring electrical sheets, are active, as are bus and truck manufacturers. These items, however, are of insufficient volume to overcome deficiencies in other flat-rolled lines. Some sellers of sheets believe the auto industry may now be at a point where buying is imperative.

Expectations of CHICAGO sheet sellers for sizable windup buys on

1939 motor cars have not been realized fully thus far. A good demand this spring before production begins for next year's models still might result in fair steel orders for the current numbers.

Bookings in the PHILADELPHIA territory are still in quite poor volume, reflecting a definite decline in miscellaneous and jobber demands and the failure of autobody stamping plants to come in for large tonnages. Most sheet sellers in eastern Pennsylvania look for little additional buying for 1939 models. One plant reports that some parts on 1940 models will be shipped to Detroit by early July, a date considerably ahead of previous years in the delivery on new models.

## REFRACTORIES

*... Prices on silica brick are announced*

LEADING refractory makers have advanced the price of silica brick, effective April 1, with the f.o.b. price per thousand on Pennsylvania silica brick advanced from \$40 to \$47.50, Chicago district price up from \$49 to \$55.10, and the Birmingham price from \$40 to \$47.50. These advances make the price practically what it was previous to the cuts made a few months ago when prices broke.

## MERCHANT BARS

*... Sales are off somewhat at Pittsburgh*

ALTHOUGH the total tonnage involved in hot rolled bar sales during the past week is off some from the week before at PITTSBURGH, there continues to be concrete evidence that diversification is expanding. Hand-to-mouth buying policies, however, persist and as a consequence, individual orders are not large.

Incoming business for CLEVELAND and YOUNGSTOWN producers during March showed a fair gain over February, in some instances around 30 per cent ahead. Allowing for the extra days in March, however, activity approximated that of February. Hand-to-mouth buying remains the practice of most consumers. The revised quantity deduction set-up has undergone little or no test to date.

CHICAGO mills and sellers are finding tractor plants, jobbers and miscellaneous sources the most active currently. Orders are small and still on a hand-to-mouth basis.

## BOLTS, NUTS, RIVETS

*... Demands spotty ... Some gains in late March*

DEMAND for these products remains spotty. In the aggregate there has been very little change in any direction, but for some producers the last week of March proved more active than any previous week of the month.

## WIRE PRODUCTS

*... Merchant items in a little better demand*

TOTAL wire sales at PITTSBURGH have been slightly more active in the past week, notably in merchant wire products. Manufacturers' wire requirements have also become slightly heavier and producers look for a continuation of the recent slight but definite increase in business. Manufacturers of fence report much greater activity than a month ago.

At CLEVELAND there has been a slightly downward tendency recently in aggregate incoming business. Operations are holding slightly in excess of 50 per cent, however. Some of the smaller jobbers are returning to the market for merchant wire products.

Good spring weather in the CHICAGO area is expected to cause noticeably increased buying of merchant wire products. Any upturn in automobile production will be reflected by operations here of seat spring makers who are now on a three-day week. They are anticipating increased orders within the next week or two for a combination of 1939 and 1940 models.

## RAILROAD BUYING

*... Several rail orders placed ... More in prospect*

ANOTHER spurt in rail buying has occurred within the past week, several roads having placed orders. The Santa Fe plans to lay about 72,000 tons of rail in 1939, almost three times as much as was laid last year. It is understood that the road has on hand from 15,000 to 20,000 tons of rails, so that the purchase will run approximately 55,000 tons. The Chicago & Northwestern has ordered 9600 tons, of which 6700 tons will be furnished by Carnegie-Illinois and 2900 tons by Inland Steel Co. The Chicago, St. Paul, Minneapolis & Omaha has placed 3000 tons of rails with Bethlehem Steel Co. This com-

pany has also received orders for 2551 tons from the Bangor & Aroostook and 1325 tons from the Boston Elevated.

Other rail tonnage is pending. The Erie is expected to buy this month, but its orders may be less than the 33,000 tons mentioned recently. The Reading is reported to have placed a small tonnage of rails and track fastenings, but details are lacking.

The Southern Pacific has ordered two streamlined trains consisting of 28 passenger cars from the Pullman-Standard Car Mfg. Co. at a reported cost of about \$2,000,000 exclusive of locomotives. The Chicago, Rock Island & Pacific has received court authorization to purchase two streamlined trains.

The Federal Court at St. Louis has authorized the St. Louis Southwestern to purchase steel underframes for 40 ballast coal cars, which, with underframes for 60 cars authorized last December, will make 100 underframes for cars that will be built in the company's shops at Pine Bluff, Ark. The underframes will be fabricated by the American Car & Foundry Co.

The Burlington Transportation Co., subsidiary of the Burlington Railroad, has ordered 25 streamlined buses from the Yellow Coach Division of General Motors Corp. The J. G. Brill Co. has received orders for 52 trolley coaches from the Delaware Electric Power Co., Wilmington, Del., and for 40 trolley coaches from the Duluth Superior Transit Co., Duluth, Minn.

## WAREHOUSE BUSINESS

*... Jobbers sales are steady ... Some changes in prices*

JOBBER sales during March in the CHICAGO district exceeded those of February slightly but were not quite up to the high point of January. The last two weeks in March were responsible for the good showing of the month as a whole. Well diversified demand is reported. April business is expected to come in at about the same rate as over the past two weeks.

March business in the NEW YORK area was just about equal to that of February, but on a daily basis showed a small loss. Light steels were relatively the most active, with shapes and plates making the poorest showing. Price revisions over the past two weeks have resulted in lower prices on cold-finished bars and, in certain quantity brackets, on cold rolled sheets.

Warehouse business in DETROIT in

March followed the pattern set in February. In some instances, volume fell below the February mark. Indications point to a slight upturn in April, with some extra buying already experienced for second quarter requirements. Although the automobile industry is not engaged in any extensive retooling for next year, minor programs are expected to bring some warehouse business out later in April. During the week of March 20 there was a change in the base price of cold rolled bars from 3.60c. per lb. to 3.85c. Quantity extras were changed to conform to the mill price structure. Warehouse base quantity remains at 1000 lb., but for quantities less than 1000 lb., the extra has been increased 25c. From 500 to 999 lb. the extra now is 50c., formerly it was 25c. per 100 lb. From 300 to 499 lb. it is \$1.25 compared with former figure of \$1. Under 300 lb. the extra is \$1.50 compared with the former extra of \$1.75.

Warehouse business in St. Louis has been quiet during the past two months, which has caused a weakness in the price situation. As a result prices on plates and shapes, bars and sheets have been reduced from 15c. to 35c. per 100 lb. to meet this local situation.

At Boston there has been a slight increase in the number of orders booked, but individual orders concern small amounts and the aggregate shipments for March continued well below those for the corresponding month last year. As compared with February, there was a very slight gain. Prices on cold finished bars and flats over 6 in. wide have been reduced 25c. per 100 lb. and some modification in quantity prices per size for 12 ft. random bars has been made.

The end of the month saw an encouraging spurt in general warehouse demand at BUFFALO. Reinforcing bars have begun to pick up considerably, although this market is not very firm. Other prices continue fairly steady.

Although sheets are enjoying a little seasonal improvement in the PHILADELPHIA territory, the aggregate volume of business for all grades has lately shown a tendency to ease off. The trend, however, has not been serious, and warehouses look for improvement by early May. Sheet prices are still fluctuating badly, but the list otherwise is quite stable. Warehouse stocks are not heavy.

Base prices on sheared and universal plates, standard shapes, and soft steel bars have been 0.4c. a lb. at San Francisco and 0.65c. a lb. at Seattle. Galvanized sheets have been reduced at Seattle and Los Angeles, but are holding steady at San Francisco. The reinforcing bar base has been materially reduced at the latter city.

## TIN PLATE

*... Operations Continue at 60%  
... Better orders expected*

**T**IN plate operations continue at 60 per cent. Substantial orders from sanitary can makers are expected within the next two weeks. Meanwhile, miscellaneous and general line can demand has expanded further and orders from these sources comprise a fair portion of total tin plate business.

## TUBULAR GOODS

*... Larger consumption of merchant pipe indicated*

**A**LTHOUGH total tubular goods sales at PITTSBURGH reflect little or no change from either a week or a month ago, there has been a better movement to jobbers' stocks and from the latter to ultimate consumption of merchant pipe. Meanwhile, oil-country goods demand is still indicative of oil companies' intentions to

keep drillings to an absolute minimum.

With orders and shipments well divided between oil country goods, line pipe and merchant pipe, March showed a gain of around 10 per cent in aggregate bookings at CLEVELAND and YOUNGSTOWN.

## A. I. & S. E. to Inspect Great Lakes Plant

**P**ITTSBURGH—Sponsored by the Detroit section, a national meeting of the Association of Iron and Steel Engineers is to be held in Detroit April 19, when an inspection tour will be conducted through the recently completed coke plant and blast furnace of the Great Lakes Steel Corp. at Ecorse, Mich. A technical program will be presented at the Fort Shelby Hotel at 8 p.m.

A paper on the design and construction of the new blast furnace at Great Lakes Steel Corp. by Raymond M. Hughes, assistant chief engineer, and William J. Rees, mechanical engineer, will be given. An article on the design and construction of the new coke plant by Charles P. Betz, superintendent, coke plant, Hanna Furnace Division, and Phillip C. Vetter, engineer, Great Lakes Steel Corp., will also be read.

An informal dinner at 6 p.m. will precede the technical program, with L. R. Milburn, electrical engineer, Great Lakes Steel Corp., acting as chairman.

## Imports at Philadelphia

**P**HILADELPHIA—The following iron and steel imports were received here during the past week: 399 tons of ferromanganese from Yugoslavia; 1000 tons of chrome ore from South Africa; 13 tons of steel bands, 16 tons of steel floor plates and 31 tons of structural shapes from Belgium.

## Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Apr. 4, 1939	Mar. 28, 1939	Mar. 7, 1938	Apr. 5, 1938	1939	1938
Fabricated structural steel awards ....	20,600	11,900	18,325	16,650	248,110	187,600
Fabricated plate awards .....	4,365	1,150	1,970	1,995	43,770	46,535
Steel sheet piling awards .....	0	3,540	1,300	890	13,205	8,650
Reinforcing bar awards .....	5,325	10,900	14,900	1,235	117,720	68,570
Total Letting of Construction Steel..	30,290	27,490	36,495	20,770	422,805	311,355



# FABRICATED STEEL

*... Lettings advance to 20,600 tons from 11,900 tons last week ... New projects call for 15,450 tons ... Plate awards total 4365 tons.*

## NORTH ATLANTIC STATES

### AWARDS

- 9300 Tons, Bob's Creek, Md., substructure, Potomac River bridge, to Carnegie-Illinois Steel Corp., Pittsburgh; through Merritt-Chapman & Scott Corp., New York.
- 1000 Tons, Willowbrook, N. Y., infirmary buildings, to Belmont Iron Works, Philadelphia; through Caye Construction Co., New York.
- 990 Tons, New York, curb angles for Department of Purchases, to American Bridge Co., Pittsburgh.
- 700 Tons, Jersey City, N. J., additions to court house, to Lehigh Structural Steel Co., Allentown, Pa.
- 600 Tons, Elizabeth, N. J., court house, to H. R. Goeller, Hillside, N. J.
- 440 Tons, Jamestown, R. I., cofferdam bracing, to Carnegie-Illinois Steel Corp., Pittsburgh.
- 400 Tons, New York, East 156th Street apartment building, to Harris Structural Steel Co., Plainfield; through Mott Haven Iron Works.
- 400 Tons, Westchester County, N. Y., Contract No. 418, to American Bridge Co.; through Cleveorock, Inc.
- 320 Tons, Brooklyn, Fort Greene Health Center, to Weatherly Steel Co., Weatherly, Pa.; through Sheppard-Pollock Co., New York.
- 300 Tons, Worcester, Mass., Coca-Cola Bottling Co. plant, to Lehigh Structural Steel Co., Allentown, Pa.; through Rowley Construction Co., Pawtucket, R. I., contractor.
- 296 Tons, East Park, N. Y., Senior and Junior High School, to Belmont Iron Works, Philadelphia, through Berbusi Co.
- 225 Tons, New York, buildings for General Baking Co., to Bethlehem Fabricators, Inc., Bethlehem, Pa.; through Equity Construction Co., New York.
- 195 Tons, Athol, Mass., Exchange Street bridge, to American Bridge Co., Pittsburgh.
- 180 Tons, Dauphin County, Pa., County home, to Bethlehem Steel Co., Bethlehem, Pa.
- 180 Tons, Townshend, Vt., bridge, to American Bridge Co., Pittsburgh; through Bianchi & Co.
- 170 Tons, Kent, Conn., library and dormitory for Kent School, to Berlin Construction Co., Springfield, Mass.; through H. H. Taylor & Son.
- 165 Tons, Lynbrook, N. Y., high school, to Bethlehem Fabricators, Inc., Bethlehem, Pa.; through Andrew Weston Co.
- 150 Tons, Trumbull, Conn., bridge, to American Bridge Co., Pittsburgh; through Marianna Construction Co.
- 145 Tons, Westport, Conn., bridge, to American Bridge Co., Pittsburgh; through Marianna Construction Co.
- 140 Tons, Washington, transportation building No. 74, to Belmont Iron Works, Philadelphia.

### THE SOUTH

- 570 Tons, Charlotte, N. C., hospital building, to Southern Engineering Co., Charlotte.
- 275 Tons, Mount Holly, N. C., State highway project, to Bethlehem Steel Co., Bethlehem, Pa.
- 260 Tons, Newport, Ky., mill building for Andrews Steel Co., to International Steel & Iron Co., Evansville, Ind.
- 245 Tons, Panama City, Fla., warehouse, to Stupp Brothers Bridge & Iron Co., St. Louis; through Doullut & Ewin.
- 240 Tons, Norfolk, Va., State highway bridge, to Virginia Bridge Co., Roanoke, Va.
- 150 Tons, Kingsport, Tenn., storage building, to Bristol Steel & Iron Works, Bristol, Tenn.; through Mead Corp.

- 150 Tons, Quitman County, Miss., State highway project, to Virginia Bridge Co., Roanoke, Va.; through Hooper Construction Co.
- 130 Tons, Corpus Christi, Tex., St. Patrick's Cathedral, to Mosher Steel Co., Dallas, Tex.; through Walsh & Burney.

### CENTRAL STATES

- 310 Tons, Bedford, Ohio, two dry dock cranes for Navy Department, to Fort Pitt Bridge Works Co., Massillon, Ohio; through R. W. Kaltenbach Corp., Bedford, Ohio.
- 275 Tons, Austin, Minn., school building, to American Bridge Co., Pittsburgh; through McGough Brothers.
- 225 Tons, Inkster, Mich., grade separation bridge, to Fort Pitt Bridge Works Co., Pittsburgh.
- 200 Tons, Sault Ste. Marie, Mich., community and recreation building, to Bethlehem Steel Co., Bethlehem, Pa.
- 225 Tons, Massillon, Ohio, stadium, to Fort Pitt Bridge Works Co., Massillon.
- 175 Tons, Rathbun, Iowa, girder spans, to Bethlehem Steel Co., Bethlehem, Pa.
- 150 Tons, Ottumwa, Iowa, addition to slaughter house, to Clinton Bridge Works, Clinton, Iowa; through Kilinger Co.

### WESTERN STATES

- 420 Tons, Los Angeles, post office and court house addition, to Consolidated Steel Corp., San Francisco; through H. M. Baruch Corp.
- 285 Tons, Hawthorne, Nev., buildings for Navy Department, to Consolidated Steel Corp., San Francisco; through William P. Neil Co.

### PENDING STRUCTURAL PROJECTS

#### NORTH ATLANTIC STATES

- 4600 Tons, Brentwood, N. Y., State buildings.
- 700 Tons, Staten Island, N. Y., grade separation for Staten Island Rapid Transit Co.
- 520 Tons, Niagara Falls, N. Y., three buildings for Great Lakes Coal & Coke Corp.
- 380 Tons, Clifton, N. J., bridges, route No. 6, sections 8 and 9; bids close April 14.
- 350 Tons, Newark, N. J., State garage and office building; bids April 14.
- 350 Tons, Pittsburgh, factory building for Allis-Chalmers Mfg. Co.
- 325 Tons, Washington, Bowen Building addition for Bricklayers', Masons' and Plasterers' International Union.
- 315 Tons, Galen, N. Y., Clyde Central School.
- 300 Tons, Mountain View, N. J., railroad bridges; bids close April 14.
- 275 Tons, Washington, St. Elizabeth Hospital.
- 225 Tons, Edgewater, N. J., plant extension for Lever Bros.
- 215 Tons, Hopedale, Mass., buildings for Draper Corp.
- 200 Tons, Pittsburgh, Bedford dwellings for Pittsburgh Housing Authority.
- 175 Tons, Oswego, N. Y., theater building for Bridge & Second Street Realty Corp.
- 125 Tons, Elkland, Pa., addition to building for Elkland Leather Co.
- 125 Tons, Wilmington, Vt., three State bridges.
- 125 Tons, Huntington-Bolton-Hinesburg, Vt., Griggs bridge; Lockwood Young, Concord, N. H., contractor.
- Unstated tonnage, Buffalo department store, W. T. Grant & Co.; bids due April 24.
- Unstated tonnage, Buffalo, addition for Sears-Roebuck & Co.

### THE SOUTH

- 300 Tons, New Orleans, Woolworth building.
- 220 Tons, Lake Charles, La., auditorium; bids in.
- CENTRAL STATES
- 4000 Tons, Lorain, Ohio, East 21st Street bridge; bids due April 18.
- 450 Tons, Abilene, Kan., power house, Kansas Power & Light Co.
- 120 Tons, Searsboro, Iowa, state bridge.

### WESTERN STATES

- 241 Tons, Kremmling, Colo., bridge; bids April 13.
- 220 Tons, Tillamook County, Ore., Mills bridge on Wilson River highway; bids April 6.
- 210 Tons, State of Montana, bridge.
- 156 Tons, Renton, Wash., Cedar bridge; bids April 11.
- 125 Tons, Antler, Cal., underpass, specification 1209-D for Bureau of Reclamation.
- 102 Tons, Seattle, Sixth Avenue undercrossing; bids April 11.

### FABRICATED PLATES

#### AWARDS

- 1600 Tons, Bob's Creek, Md., substructure, Potomac River bridge, to Carnegie-Illinois Steel Corp., Pittsburgh, through Merritt-Chapman & Scott Corp., New York.
- 2215 Tons, Toledo, city pipe line, Divisions A and B, to Bethlehem Steel Co., Bethlehem, Pa.; through Joseph Kalill Co., Cleveland.
- 350 Tons, Framingham, Mass., standpipe, to Pittsburgh-Des Moines Steel Co., Pittsburgh.
- 200 Tons, La Grange, Ill., tank for municipality, to Chicago Bridge & Iron Co., Chicago.

### SHEET PILING

#### PENDING PROJECTS

- 1800 Tons, Cleveland, Cuyahoga River straightening, bulkhead Cut No. 4; Great Lakes Dredge & Dock Co. low bidder.
- 300 Tons, Cleveland, Big Creek Intercepting sewer; Lombardo Brothers Construction Co., Cleveland, general contractor.
- 132 Tons, Lawrence County, Ohio, State highway project; bids in.

## Metallurgists Promoted By American Steel & Wire

L. F. McGLINCY has become division metallurgist on heating and hot rolling in the main office metallurgical staff of the American Steel & Wire Co., Cleveland. He was formerly open-hearth and hot mill superintendent for the company at Worcester, Mass. R. H. BARNES, formerly district metallurgist in Cleveland, becomes division metallurgist on flat rolled products and strip. Assistant division metallurgist on high-carbon products is A. F. ILACQUA formerly standard practice metallurgist at Worcester. JOHN F. OCCASIONE becomes assistant division metallurgist on coatings. Formerly he was in charge of similar work for the Cleveland district. New assistant division metallurgist on standard practice is J. E. MILLEN, who was formerly in charge of statistical work in the company's physical laboratory in the Cleveland district.

L. W. GREVE, president, Cleveland Pneumatic Tool Co., Cleveland, has been elected a director of Cleveland Graphite Bronze Co. Other officers and directors were reelected.

BLAIR C. HANNA, Columbus, Ohio, has been elected to the board of directors of Ralston Steel Car Co., Columbus, filling the place of the late CHARLES S. YOUNGER. Mr. Hanna also is vice-president and sales manager.

# ... NON-FERROUS ...

... *Disturbed world outlook continues to restrict buying*  
... *Copper price cut to 10.75c. per lb. by custom smelter; producers adhere to 11.25c.*

NEW YORK, April 4—Although the tension felt over the political situation abroad showed signs of moderating over the week-end, consumers here still feel that the future outlook is too uncertain to warrant purchasing more than sufficient supplies to cover actual business in sight. Consequently, sales of non-ferrous metals continue at a very low level. The only outstanding feature of the market in the past week was the

action of a large custom smelter cutting electrolytic prices to 10.75c. per lb., Connecticut Valley, the first movement in copper prices since 11.25c. was established on Oct. 14, 1938. At the time of going to press, none of the major domestic producers had met this new price. In the absence of a change in producers' quotations, Lake copper prices are unchanged at 11.375c. per lb. The reduction followed closely behind the break

in the securities market late last week and so far has not resulted in any appreciable improvement in sales. In the open market, a moderate business was done early last week at around 10.625c. per lb., but with cut in the custom smelter's price, offerings declined to 10.55c. but failed to attract much interest.

## Lead

Sales in the past week totaled 7700 tons, but 4600 tons of this was the average price business which is booked early each month. The balance, after deducting the average price business, of 3100 tons compares with 7400 tons in the preceding week. Most of the week's bookings were for April delivery, bringing that month's coverage up to about 70 per cent. May requirements are only 20 per cent covered, indicating the cautious buying policy being followed by consumers. Domestic prices are unchanged at 4.85c. per lb., New York, while this morning's London price on prompt lead was down to 2.97c. per lb.

## Zinc

Bookings of Prime Western metal in the past week totaled 2140 tons, mostly for April shipments. While this figure is slightly above the previous week's figure, it is still a good bit below the estimated rate of current consumption. Shipments in the week were 3857 tons against 3100 in the preceding period. Domestic quotations are unaltered at 4.89c. per lb., New York, with sellers showing no inclination to press for sales.

## Tin

Demand during the past week was in moderate volume, with tin plate mills seeking nearby positions accounting for the bulk of the activity. The fluctuations in prices followed fairly closely the actions of the stock market. Today's New York price on prompt Straits metal is 46.25c. per lb., or 25 points below the prices of a week ago. On first call in London this morning cash standards were £215 against £216 last Tuesday.

## NON-FERROUS PRICES

Cents per lb. for early delivery

	Mar. 29	Mar. 30	Mar. 31	Apr. 1	Apr. 3	Apr. 4
Copper, Electrolytic <sup>1</sup> .....	11.25	11.25	11.25	11.25	10.75	10.75
Copper, Lake .....	11.375	11.375	11.375	11.375	11.375	11.375
Tin, Straits, New York .....	46.625	46.50	46.50	....	46.50	46.25
Zinc, East St. Louis <sup>2</sup> .....	4.50	4.50	4.50	4.50	4.50	4.50
Lead, St. Louis <sup>3</sup> .....	4.70	4.70	4.70	4.70	4.70	4.70

<sup>1</sup> Delivered Conn. Valley, deduct ¼c. for New York delivery. <sup>2</sup> Add 0.39c. for New York delivery. <sup>3</sup> Add 0.15c. for New York delivery.

## Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits pig .....	47.50c.	49.75c.
Copper, Lake .....	12.25c.	12.375c.
Copper, electro .....	11.00c.	11.875c.
Copper, castings .....	11.25c.	11.875c.
*Copper sheets, hot-rolled .....	19.375c.	19.375c.
*High brass sheets .....	17.31c.	17.31c.
*Seamless brass tubes .....	20.06c.	20.06c.
*Seamless copper tubes .....	19.875c.	19.875c.
*Brass rods .....	12.62c.	12.62c.
Zinc slabs .....	6.25c.	7.00c.
Zinc sheets, No. 9 casks .....	10.50c.	12.10c.
Lead, American pig .....	5.85c.	5.60c.
Lead, bar .....	6.35c.	8.35c.
Lead, sheets, cut .....	8.00c.	8.00c.
Antimony, Asiatic .....	15.00c.	17.00c.
Alum., virgin, 99 per cent plus .....	22.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent .....	19.50c.	19.50c.
Solder, ½ and ½ .....	28.30c.	28.75c.
Babbitt metal, commercial grade .....	21.50c.	21.00c.

\* These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/3; on brass sheets and rods, 40, and on brass and copper tubes, 25.

## Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible ..	8.375c.	9.125c.
Copper, hvy. and wire ..	7.375c.	7.875c.
Copper, light and bottoms .....	6.625c.	6.875c.
Brass, heavy .....	4.50c.	5.00c.
Brass, light .....	3.625c.	4.375c.
Hvy. machine composition .....	6.50c.	8.00c.
No. 1 yel. brass turnings ..	4.25c.	4.75c.
No. 1 red brass or comp. pos. turnings .....	6.25c.	6.875c.
Lead, heavy .....	3.625c.	4.50c.
Cast aluminum .....	7.00c.	8.25c.
Sheet aluminum .....	12.25c.	13.75c.
Zinc .....	2.25c.	3.50c.

## Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered; virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt, No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt, New York; Asiatic, 14c. a lb. f.o.b.; American, 11.50c. a lb. QUICK-SILVER, \$89.50-\$90.50 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 11c. a lb.

## Non-Ferrous Average Prices

The average prices of the major non-ferrous metals in March, based on quotations appearing in THE IRON AGE, were as follows:

	Per Lb.
Electrolytic copper, Conn. Valley ..	11.25c.
Lake copper, Eastern delivery ..	11.375c.
Straits tin, spot, New York ....	46.17c.
Zinc, East St. Louis .....	4.50c.
Zinc, New York .....	4.89c.
Lead, St. Louis .....	4.67c.
Lead, New York .....	4.82c.



# IRON AND STEEL SCRAP

**A**PRIL 4—Uncertainties abroad and in domestic steel mill business is reflected in the lethargic scrap market that exists throughout the country. Practically no important mill buying took place last week. Technically a small decline in the average price of No. 1 steel took place at PITTSBURGH because brokers are offering to sell some supplies at \$15.50, although still getting \$16 at other points. None would part with No. 1 below \$15.75 the week before. With prices unchanged at CHICAGO and PHILADELPHIA, the composite price becomes \$15.25, down 4c. from the high of the year registered on March 28. In other districts an unsettled condition prevails. Evidence of softness is seen at Detroit, but buying prices are unchanged. Dealers' buying prices at CINCINNATI are down 25c. sentimentally.

No new commitments have been made by representatives of the International Scrap Convention who have just concluded a visit to the United States, but extensions on existing contracts have been made to a limited extent without any adjustment in price. Export buying prices are steady except at PHILADELPHIA, where No. 1 steel is at a premium.

## Pittsburgh

The market is slightly easier this week and No. 1 heavy melting steel is quotable at \$15.50 to \$16, down 12½c. from last week's average price. Brokers are able to pick up some supplies at \$15.50 and some consumers have been offered small tonnages at this figure. Meanwhile, other points in the district are paying \$16 a ton. The market lacks sparkle, with little transactions going on either between brokers and dealers or between brokers and consumers. Railroad heavy melting steel is slightly weaker and the situation may be further clarified when data on railroad lists being closed this week are obtained.

## Chicago

Trading in this area is very quiet at the moment and, from all indications, will continue so for a time. Distress tonnages of No. 1 steel may be obtained for \$13.75, and railroad lists are also bringing less money, both facts denoting prevalent weakness. Little buying at any price is being seen, however. Many cars still are congested on tracks outside the leading buyer's plant, a situation which is adding to the reluctance to buy or sell on the part of most traders. Declining operations do not foreshadow important mill interest in the near future. The last mill sale was at \$14.50.

## Philadelphia

Spotty shipments continue to go into nearby mills, but practically all consum-

ers are in good shape as regards scrap requirements and for that reason are giving little support to the present market. A possible exception is machine shop turnings, which is enjoying a flurry in demand from two local mills, with prices ranging around \$9.50 to \$10. It is more than likely that lower quotations would be ruling here now if export buying had not maintained a fairly steady pace. Shipments continue to go to Port Richmond, with No. 1 steel bringing prices between \$15 and \$15.50; clearings from the port are still approximating 15,000 tons monthly, mostly for delivery to the Far East. Indicative of the slight hesitancy in the current situation is the disposition of the April E. G. Budd Co. bundles, which totaled 3400 tons and went to a broker at just a few cents per ton over the March bid.

## Cleveland

The market has become unsettled here within the past week, but whether it is purely a temporary condition remains to be seen. There have been no sales to substantiate price revisions, but sentiment at least has taken a downward turn. Shipments against recent sales are going forward. The monthly railroad lists, closing this week, are expected to provide an insight. The lists are comparatively small.

## Youngstown

Shipments are under stricter regulation this week than for several weeks past. While operations of some steel companies are holding unchanged, doubts exist as to whether present activity can be maintained very long. If anything, the market may be weaker but sales for confirmation are lacking.

## Buffalo

The market is uncertain and reports vary to such an extent that it is difficult to ascertain its true status. A fair amount of scrap moved last month but the tonnage was dispersed over many sales. A large proportion of the volume was composed of No. 2 bundles selling in a range, which if the usual differential were computed, would place No. 1 heavy melting steel at \$13.25 to \$13.75. It is practically certain, however, that dealers would refuse such a figure. No. 1 steel appears firm at \$14.00 to \$14.50 in the absence of significant sales of that commodity. Shipments to the larger mills this week are either held up or restricted.

## St. Louis

Because of a lack of interest by mills, the scrap iron market in St. Louis is weak, and some prices are lower. Miscellaneous standard section rails are 25c. off, and bundled sheets, steel angle bars, grate bars and brake shoes 50c. lower, and stove plate \$1 less. Railroad lists: Baltimore & Ohio, 7000 tons; Missouri Pacific, 1400 tons; New York, Chicago & St. Louis, 1200 tons; and Alton, 500 tons.

## Cincinnati

Foreign complications and stock market gyrations unsettled the local old materials market, the past week, weakening

prices on all items. Bids are down nominally 25c. with predictions of further easing if the present uncertainties persist. Mills are backing away and dealers are prone to mark time.

## Detroit

Successive signs of weakness were seen last week as automotive lists closed, with the plants accepting lower prices near the end of the week. However, some of the earlier bids went above the current IRON AGE quotations for the Detroit area. On the basis of this information, quotations are unchanged, but it is anticipated that the evidence of softening will be followed by a reduction in mill buying prices. Tonnages sold on the list estimated April output of scrap considerably below March output. Part of this is attributable to the potentially shorter work month and part is attributable to a sharp reduction in automotive production schedules for April.

## Boston

The export market is moderately active, current buying being against old orders. Prices are steady and unchanged. The domestic delivery market is at a standstill, the withdrawal of the Weirton Steel Co. from the bundled skeleton market leaving the market without a buyer. The American Steel & Wire Co., Worcester, Mass., is still down, but will resume operations as soon as new wage agreements have been signed. New England buying of machinery and textile cast is confined to an occasional truck lot.

## New York

All but one of the three representatives of the International Scrap Convention have returned to England after investigating market conditions on the Eastern seaboard. No new contracts were signed with American brokers, but moderate extensions were made on previous contracts, on which the base price was around \$15 a ton f.a.s. for No. 1 steel. It is estimated that less than 75,000 tons were placed on this extended basis. The Japanese bought at month's end, but it is understood all the material is to be shipped from the West Coast, no orders having been placed with Eastern brokers. Buying prices for export are maintaining the status quo.

## Toronto

Demand for iron and steel scrap parallels business in other steel lines. Demand for most materials is practically at a standstill, although the mills are taking heavy melting steel as offered and are setting their own price. Dealers are carrying very little heavy melting steel in their yards and new offerings are small. Machinery cast also has fair market demand with little material available. The larger users, however, mostly are well stocked and sales in these directions are restricted for the present. Stove plate also is lightly held with a market for available supplies, while other materials are listless. Dealers are procuring scrap in larger quantities and considerable tonnage has been delivered to local dealers in the past two or three weeks. Prices are unchanged.



# Iron and Steel Scrap Prices

## PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mtng. steel.	\$15.50 to \$16.00
Railroad hvy. mtng.	16.25 to 16.75
No. 2 hvy. mtng. steel.	14.25 to 14.75
Scrap rails	16.50 to 17.00
Rails 3 ft. and under.	18.25 to 18.75
Comp. sheet steel	15.50 to 16.00
Hand bundled sheets	14.50 to 15.00
Hvy. steel axle turn.	14.00 to 14.50
Machine shop turn.	9.50 to 10.00
Short shov. turn.	11.00 to 11.50
Mixed bor. & turn.	9.00 to 9.25
Cast iron borings	9.00 to 9.25
Cast iron carwheels	15.00 to 15.50
Hvy. breakable cast.	12.50 to 13.00
No. 1 cupola cast.	15.25 to 15.75
RR. knuckles & cplrs.	17.50 to 18.00
Rail coil & leaf springs	18.00 to 18.50
Rolled steel wheels	18.00 to 18.50
Low phos. billet crops	19.00 to 19.50
Low phos. punchings	17.50 to 18.00
Low phos. plate	16.50 to 17.00

## PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mtng. steel.	\$15.50 to \$16.00
No. 2 hvy. mtng. steel.	13.50 to 14.00
Hydraulic bund., new.	14.50 to 15.00
Hydraulic bund., old.	11.50 to 12.00
Steel rails for rolling	17.00 to 17.50
Cast iron carwheels	16.50 to 17.00
Hvy. breakable cast.	15.00 to 15.50
No. 1 cast	16.50 to 17.00
Stove plate (steel wks.)	13.00 to 13.50
Railroad malleable	15.50 to 16.00
Machine shop turn.	9.50 to 10.00
No. 1 blast furnace	6.50 to 7.00
Cast borings	6.50 to 7.00
Heavy axle turnings	10.00 to 10.50
No. 1 low phos. hvy.	17.50 to 18.00
Couplers & knuckles	17.50 to 18.00
Rolled steel wheels	17.50 to 18.00
Steel axles	20.00 to 20.50
Shafting	20.50 to 21.00
Spec. iron & steel pipe	12.00 to 12.50
No. 1 forge fire	12.00 to 12.50
Cast borings (chem.)	9.50 to 10.00

## CHICAGO

Delivered to Chicago district consumers:

Per Gross Ton	
Hvy. mtng. steel	\$14.00 to \$14.50
Auto. hvy. mtng. steel alloy free	12.50 to 13.00
No. 2 auto steel	11.50 to 12.00
Shoveling steel	14.00 to 14.50
Factory bundles	13.00 to 13.50
Dealers' bundles	12.50 to 13.00
Drop forge flashings	10.50 to 11.00
No. 1 busheling	12.50 to 13.00
No. 2 busheling, old.	5.75 to 6.25
Rolled carwheels	16.00 to 16.50
Railroad tires, cut	16.00 to 16.50
Railroad leaf springs	16.00 to 16.50
Steel coup. & knuckles	16.00 to 16.50
Axle turnings	13.00 to 13.50
Coil springs	17.00 to 17.50
Axle turn. (elec.)	14.00 to 14.50
Low phos. punchings	16.50 to 17.00
Low phos. plates 12 in. and under	16.00 to 16.50
Cast iron borings	5.50 to 6.00
Short shov. turn.	7.50 to 8.00
Machine shop turn.	7.00 to 7.50
Rerolling rails	17.00 to 17.50
Steel rails under 3 ft.	16.25 to 16.75
Steel rails under 2 ft.	17.00 to 17.50
Angle bars, steel	16.00 to 16.50
Cast iron carwheels	12.75 to 13.25
Railroad malleable	16.00 to 16.50
Agric. malleable	11.25 to 11.75

Per Net Ton	
Iron car axles	\$18.50 to \$19.00
Steel car axles	18.00 to 18.50
Locomotive tires	14.00 to 14.50
Pipes and flues	9.50 to 10.00
No. 1 machinery cast.	12.50 to 13.00
Clean auto. cast.	13.00 to 13.50
No. 1 railroad cast.	11.50 to 12.00
No. 1 agric. cast.	10.25 to 10.75
Stove plate	7.75 to 8.25
Grate bars	9.00 to 9.50
Brake shoes	9.25 to 9.75

## YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mtng. steel.	\$15.50 to \$16.00
No. 2 hvy. mtng. steel.	14.50 to 15.00
Low phos. plate	16.00 to 16.50
No. 1 busheling	14.75 to 15.25
Hydraulic bundles	15.00 to 15.50
Machine shop turn.	10.25 to 10.75

## CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mtng. steel.	\$14.50 to \$15.00
No. 2 hvy. mtng. steel.	13.50 to 14.00
Comp. sheet steel	14.00 to 14.50
Light bund. stampings	10.75 to 11.25
Drop forge flashings	13.00 to 13.50
Machine shop turn.	7.50 to 8.00
Short shov. turn.	8.00 to 8.50
No. 1 busheling	14.00 to 14.50
Steel axle turnings	11.50 to 12.00
Low phos. billet and bloom crops	18.00 to 18.50
Cast iron borings	8.50 to 9.00
Mixed bor. & turn.	8.50 to 9.00
No. 2 busheling	8.50 to 9.00
No. 1 cupola cast.	16.50 to 17.00
Railroad grate bars	9.50 to 10.00
Stove plate	9.50 to 10.00
Rails under 3 ft.	17.75 to 18.25
Rails for rolling	17.00 to 17.50
Railroad malleable	15.50 to 16.00
Cast iron carwheels	14.50 to 15.00

## BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mtng. steel.	\$14.00 to \$14.50
No. 2 hvy. mtng. steel.	12.00 to 12.50
Scrap rails	15.00 to 15.50
New hvy. b'ndled sheets	12.00 to 12.50
Old hydraul. bundles	10.75 to 11.25
Drop forge flashings	12.00 to 12.50
No. 1 busheling	12.00 to 12.50
Hvy. axle turnings	10.50 to 11.00
Machine shop turn.	6.50 to 7.00
Knuckles & couplers	16.50 to 17.00
Coil & leaf springs	16.50 to 17.00
Rolled steel wheels	16.00 to 16.50
Low phos. billet crops	15.50 to 16.00
Shov. turnings	8.75 to 9.25
Mixed bor. & turn.	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Steel car axles	16.50 to 17.00
No. 1 machinery cast.	15.00 to 16.00
No. 1 cupola cast.	14.50 to 15.00
Stove plate	13.00 to 13.50
Steel rails under 3 ft.	18.00 to 18.50
Cast iron carwheels	13.50 to 14.00
Railroad malleable	15.00 to 15.50
Chemical borings	9.00 to 9.50

## ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	\$12.00 to \$12.50
No. 1 hvy. melting	12.00 to 12.50
No. 2 hvy. melting	11.50 to 12.00
No. 1 locomotive tires	13.00 to 13.50
Misc. stand. sec. rails	13.50 to 14.00
Railroad springs	14.00 to 14.50
Bundled sheets	7.00 to 7.50
No. 1 busheling	7.50 to 8.00
Cast. bor. & turn.	2.50 to 3.00
Machine shop turn.	4.00 to 4.50
Heavy turnings	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Steel car axles	17.00 to 17.50
No. 1 RR. wrought	10.25 to 10.75
No. 2 RR. wrought	12.00 to 12.50
Steel rails under 3 ft.	16.00 to 16.50
Steel angle bars	13.50 to 14.00
Cast iron carwheels	14.50 to 15.00
No. 1 machinery cast.	14.50 to 15.00
Railroad malleable	12.25 to 12.75
No. 1 railroad cast.	12.50 to 13.00
Stove plate	7.50 to 8.00
Grate bars	8.50 to 9.00
Brake shoes	9.50 to 10.00

## CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mtng. steel.	\$12.00 to \$12.50
No. 2 hvy. mtng. steel.	9.75 to 10.25
Scrap rails for mtng.	15.50 to 16.00
Loose sheet clippings	7.25 to 7.75
Hydrau. b'ndled sheets	11.50 to 12.00
Cast iron boring	3.75 to 4.25
Machine shop turn.	5.25 to 5.75
No. 1 busheling	8.00 to 8.50
No. 2 busheling	2.75 to 3.25
Rails for rolling	17.50 to 18.00
No. 1 locomotive tires	14.25 to 14.75
Short rails	18.25 to 18.75
Cast iron carwheels	13.25 to 13.75
No. 1 machinery cast.	14.00 to 14.50
No. 1 railroad cast.	12.75 to 13.25
Burnt cast	6.75 to 7.25
Stove plate	6.75 to 7.25
Agricul. malleable	11.75 to 12.25
Railroad malleable	14.25 to 14.75
Mixed hvy. cast	11.00 to 11.50

## BIRMINGHAM

Per gross ton delivered to consumer:

Hvy. melting steel.	\$12.50 to \$14.00
Scrap steel rails	14.50 to 15.00
Short shov. turnings	7.50 to 8.10
Stove plate	9.00 to 10.00
Steel axles	15.00 to 16.00
Iron axles	15.00 to 16.00
No. 1 RR. wrought	10.00
Rails for rolling	16.00 to 16.50
No. 1 cast	14.50
Tramcar wheels	14.00

## DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mtng. industrial steel	\$11.00 to \$11.50
No. 2 hvy. mtng. steel	9.50 to 10.00
Borings and turnings	6.50 to 7.00
Long turnings	6.00 to 6.50
Short shov. turnings	7.00 to 7.50
No. 1 machinery cast.	13.50 to 14.00
Automotive cast	13.75 to 14.25
Hvy. breakable cast.	10.00 to 10.50
Stove plate	8.00 to 8.50
Hydraul. comp. sheets	12.25 to 12.75
New factory bushel.	11.00 to 11.50
Sheet clippings	8.50 to 9.50
Flashings	10.25 to 10.75
Low phos. plate scrap	12.25 to 12.75

## NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mtng. steel	\$11.00 to \$11.50
No. 2 hvy. mtng. steel	9.50 to 10.00
Hvy. breakable cast.	10.50 to 11.00
No. 1 machinery cast.	11.50 to 12.00
No. 2 cast	9.50 to 10.00
Stove plate	9.50 to 10.00
Steel car axles	20.00 to 20.50
Shafting	15.50 to 16.00
No. 1 RR. wrought	11.00 to 11.50
No. 1 wrought long	9.50 to 10.00
Spec. iron & steel pipe	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Clean steel turnings*	4.00 to 4.50
Cast borings*	3.50 to 4.00
No. 1 blast furnace	3.50 to 4.00
Cast borings (chem.)	9.50 to 10.00
Unprepared yard scrap	6.00 to 6.50
Light iron	3.00 to 3.50
Per gross ton, delivered local foundries:	
No. 1 machn. cast†	\$13.50 to \$14.00
No. 2 cast†	10.50 to 11.00

\* \$1.50 less for truck loads.

† Northern N. J. prices are \$2 to \$2.50 higher.

## BOSTON

Dealers' buying prices per gross ton:

No. 1 hvy. mtng. steel	Nominal
Scrap rails	Nominal
No. 2 steel	Nominal
Breakable cast	\$10.15
Machine shop turn.	\$3.28 to \$4.15
Mixed bor. & turn.	\$2.00 to 2.25
Bun. skeleton long	8.50 to 8.60
Shafting	15.50 to 15.65
Cast bor. chemical	4.50 to 5.00
Per gross ton delivered consumers' yards:	
Textile cast	\$12.50 to \$14.00
No. 1 machine cast	12.50 to 14.00

## PACIFIC COAST

Per gross ton delivered to consumer:

No. 1 hvy. mtng. steel.	\$12.50 to \$14.00
No. 2 hvy. mtng. steel.	11.50 to 13.00

## CANADA

Dealers' buying prices at their yards, per gross ton:

Toronto Montreal	
No. 1 hvy. mtng. steel.	\$9.75 \$9.25
No. 2 hvy. mtng. steel.	8.25 7.75
Mixed dealers steel	7.00 6.50
Drop forge flashings	9.00 8.50
New loose clippings	4.50 4.00
Busheling	4.25 3.75
Scrap pipe	5.50 5.00
Steel turnings	5.00 4.50
Cast borings	3.75 3.25
Machinery cast	15.00 14.00
Dealers cast	13.00 12.00
Stove plate	11.00 10.00

## EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges	
No. 1 hvy. mtng. steel.	\$12.00 to \$12.50
No. 2 hvy. mtng. steel.	10.50 to 11.00
No. 2 cast	10.50 to 11.00
Stove plate	9.50 to 10.00
Boston on cars at Army Base or Mystic Wharf	
No. 1 hvy. mtng. steel.	\$13.50 to \$14.00
No. 2 hvy. mtng. steel.	12.50 to 13.00
Rails (scrap)	13.50 to 14.00
Mixed textile and machinery cast	12.00
Philadelphia, delivered alongside boats, Port Richmond	
No. 1 hvy. mtng. steel.	\$15.00 to \$15.50
No. 2 hvy. mtng. steel.	13.50 to 14.00

## PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition.

### SEMI-FINISHED STEEL

#### Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are \$2 higher. F.o.b. Duluth, billets only, \$2 higher.

Per Gross Ton  
Rerolling .....\$34.00  
Forging quality ..... 40.00

#### Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton  
Open hearth or besse-mer .....\$34.00

#### Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.  
Grooved, universal and sheared .....1.90c.

#### Wire Rods

(No. 5 to 9/32 in.)

Per Gross Ton  
Pittsburgh, Chicago or Cleveland .....\$43.00  
Worcester, Mass. .... 45.00  
Birmingham ..... 43.00  
San Francisco ..... 52.00  
Rods over 9/32 in. or 47/64 in. inclusive, \$5 a ton over base.

### SOFT STEEL BARS

#### Base per Lb.

Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham ..... 2.25c.  
Detroit, delivered ..... 2.35c.  
Duluth ..... 2.35c.  
Philadelphia, delivered ..... 2.57c.  
New York ..... 2.59c.  
On cars dock Gulf ports ..... 2.60c.  
On cars dock Pacific ports ..... 2.85c.

### RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham ..... 2.10c.  
On cars dock Tex. Gulf ports.. 2.45c.  
On cars dock Pacific ports.... 2.70c.

### BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt. .... 1.90c. to 2.05c.  
Detroit, delivered .... 2.00c. to 2.15c.  
On cars dock Tex. Gulf ports ..... 2.25c. to 2.40c.  
On cars dock Pacific ports.... 2.50c.

### RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham .... 1.75c. to 1.90c.  
Detroit, delivered .... 1.85c. to 2.00c.  
On cars dock Tex. Gulf ports ..... 2.10c. to 2.25c.  
On cars dock Pacific ports.... 2.35c.

Prices on reinforcing bars have been subject to concessions of \$3 a ton or more from above quotations.

### IRON BARS

Chicago and Terre Haute .... 2.15c.  
Pittsburgh (refined) ..... 3.60c.

### COLD FINISHED BARS AND SHAFTING\*

#### Base per Lb

Pittsburgh, Buffalo, Cleveland, Chicago and Gary ..... 2.70c.  
Detroit ..... 2.75c.

\* In quantities of 10,000 to 19,999 lb.

### PLATES

#### Base per Lb.

Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del... 2.10c.  
Philadelphia, del'd ..... 2.15c.  
New York, del'd ..... 2.29c.  
On cars dock Gulf ports ..... 2.45c.  
On cars dock Pacific ports ..... 2.60c.  
Wrought iron plates, P't'g.... 3.80c.

### FLOOR PLATES

Pittsburgh or Chicago ..... 3.35c.  
New York, del'd ..... 3.71c.  
On cars dock Gulf ports ..... 3.70c.  
On cars dock Pacific ports.... 3.95c.

### STRUCTURAL SHAPES

#### Base per Lb.

Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham ..... 2.10c.  
Philadelphia, del'd ..... 2.215c.  
New York, del'd ..... 2.27c.  
On cars dock Gulf ports..... 2.45c.  
On cars dock Pacific ports.... 2.70c.

### STEEL SHEET PILING

#### Base per Lb.

Pittsburgh, Chicago or Buffalo 2.40c.  
On cars dock Gulf ports ..... 2.85c.  
On cars dock Pacific ports.... 2.90c.

### RAILS AND TRACK SUPPLIES

#### F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton.....\$40.00  
Angle bars, per 100 lb. .... 2.70

#### F.o.b. Basing Points

Light rails (from billets) per gross ton .....\$40.00  
Light rails (from rail steel) per gross ton ..... 39.00

#### Base per Lb.

Cut spikes ..... 3.00c.  
Screw spikes ..... 4.55c.  
Tie plates, steel ..... 2.15c.  
Tie plates, Pacific Coast ports. 2.25c.  
Track bolts, to steam railroads 4.15c.  
Track bolts to jobbers, all sizes (per 100 counts) ..... 65-5

Basing points on light rails at Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa.; Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

### SHEETS

#### Hot Rolled

#### Base per Lb.

Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago ..... 2.15c.  
Detroit, delivered ..... 2.25c.  
Philadelphia, delivered ..... 2.32c.  
Granite City ..... 2.25c.  
On cars dock Pacific ports.... 2.65c.  
Wrought iron, Pittsburgh .... 4.25c.

#### Cold Rolled\*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago ..... 3.20c.  
Detroit, delivered ..... 3.30c.  
Granite City ..... 3.30c.  
Philadelphia, delivered ..... 3.52c.  
On cars dock Pacific ports.... 3.30c.

\* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

#### Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham ..... 3.50c.  
Philadelphia, del'd ..... 3.67c.  
Granite City ..... 3.60c.  
On cars dock Pacific ports.... 4.00c.  
Wrought iron Pittsburgh .... 6.10c.

### Electrical Sheets

#### (F.o.b. Pittsburgh)

#### Base per Lb.

Field grade ..... 3.20c.  
Armature ..... 3.55c.  
Electrical ..... 4.05c.  
Motor ..... 4.95c.  
Dynamo ..... 5.65c.  
Transformer 72 ..... 6.15c.  
Transformer 65 ..... 7.15c.  
Transformer 58 ..... 7.65c.  
Transformer 52 ..... 8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

#### Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary.... 3.95c  
F.o.b. cars dock Pacific ports. 4.65c

#### Vitreous Enameling Stock, 20 Gage\*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland ..... 3.35c.  
Detroit, del'd ..... 3.45c.  
Granite City ..... 3.45c.  
On cars dock Pacific ports.... 3.95c

### TIN MILL PRODUCTS

#### \*Tin Plate

#### Per Base Box

Standard cokes, Pittsburgh, Chicago and Gary .....\$5.00  
Standard cokes, Granite City... 5.10

\* Prices effective Nov. 10 on shipments through first quarter of 1939.

#### Special Coated Manufacturing Ternes

#### Per Base Box

Granite City .....\$4.40  
Pittsburgh or Gary ..... 4.30

#### Roofing Terne Plate

#### (F.o.b. Pittsburgh)

(Per Package, 112 sheets, 20 x 28 in.)  
8-lb. coating I.C.....\$12.00  
15-lb. coating I.C..... 14.00  
20-lb. coating I.C..... 15.00  
25-lb. coating I.C..... 16.00  
30-lb. coating I.C..... 17.25  
40-lb. coating I.C..... 19.50

#### Black Plate, 29 gage and lighter

Pittsburgh, Chicago and Gary 3.05c.  
Granite City ..... 3.15c.  
On cars dock Pacific ports, boxed ..... 4.00c

### HOT ROLLED STRIP

(Widths up to 12 in.)

#### Base per Lb

Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham 2.15c.  
Detroit, delivered ..... 2.25c.

#### Cooperage Stock

Pittsburgh & Chicago..... 2.25c

### COLD ROLLED STRIP\*

#### Base per Lb

Pittsburgh, Youngstown or Cleveland ..... 2.95c.  
Chicago ..... 3.05c.  
Detroit, delivered ..... 3.05c.  
Worcester ..... 3.15c.

\* Carbon 0.25 and less.

#### Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland ..... 3.10c  
Detroit, delivered ..... 3.20c.  
Worcester ..... 3.50c.

### COLD ROLLED SPRING STEEL

#### Pittsburgh and

#### Cleveland Worcester

Carbon 0.26-0.50% 2.95c. 3.15c.  
Carbon .51-.75 4.30c. 4.50c.  
Carbon .76-1.00 6.15c. 6.35c.  
Carbon 1.01 to 1.25 8.35c. 8.55c.



## WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

### To Manufacturing Trade

	Per Lb.
Bright wire .....	2.60c.
Galvanized wire, base .....	2.65c.*
Spring wire .....	3.20c.

\* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

### To the Trade

	Base per Keg
Standard wire nails .....	\$2.45
Coated nails .....	2.45
Cut nails, carloads .....	3.60

### Base per 100 Lb.

Annealed fence wire .....	\$2.95
Galvanized fence wire .....	3.35
Polished staples .....	3.15
Galvanized staples .....	3.40
Twisted barbed wire .....	3.30
Woven wire fence, base column. 67	
Single loop bale ties, base col... 56	
Stand. 2 pt., 12.5 gage barbed	
cattle wire, per 80 rod spool...\$2.62	
Stand. 2 pt., 12.5 gage barbed	
hog wire, per 80 rod spool...\$2.80	

Note: Birmingham base same on above items, except spring wire.

Add \$4 a ton for Mobile, Ala.; \$5 for New Orleans; \$6 for Lake Charles to above bases, except on galvanized and annealed merchant fence wire, which are \$1 a ton additional in each case.

## STEEL AND WROUGHT IRON PIPE AND TUBING

### Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

### Butt Weld

In.	Steel Black Galv.	Wrought Iron In. Black Galv.
1/2	56	36
3/4	59	43 1/2
1	63 1/2	54
1 1/4	66 1/2	58
1 1/2	68 1/2	60 1/2

### Lap Weld

2	61	52 1/2
2 1/2	64	55 1/2
3 1/2	66	57 1/2
7 & 8	65	55 1/2
9 & 10	64 1/2	55
11 & 12	63 1/2	54

Butt weld, extra strong, plain ends	1/2	3/4	1	1 1/4	1 1/2
1/2	54 1/2	41 1/2	56 1/2	45 1/2	51 1/2
3/4	56 1/2	43 1/2	58 1/2	47 1/2	53 1/2
1	58 1/2	45 1/2	60 1/2	49 1/2	55 1/2
1 1/4	60 1/2	47 1/2	62 1/2	51 1/2	57 1/2
1 1/2	62 1/2	49 1/2	64 1/2	53 1/2	59 1/2

Lap weld, extra strong, plain ends	2	2 1/2	3 1/2	7 & 8	9 & 10	11 & 12
2	59	51 1/2	53 1/2	51 1/2	51 1/2	51 1/2
2 1/2	63	55 1/2	57 1/2	55 1/2	55 1/2	55 1/2
3 1/2	66 1/2	59	61 1/2	58 1/2	58 1/2	58 1/2
7 & 8	65 1/2	56	63 1/2	60 1/2	60 1/2	60 1/2
9 & 10	64 1/2	55	62 1/2	59 1/2	59 1/2	59 1/2
11 & 12	63 1/2	54	61 1/2	58 1/2	58 1/2	58 1/2

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher, on all butt weld 8 in. and smaller.

### Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless Cold Drawn	Hot Rolled	Lap Weld Hot Rolled
1 in. o.d. ... 13 R.W.G.	\$ 9.01	\$ 7.82	...
1 1/4 in. o.d. ... 13 R.W.G.	10.67	9.26	...
1 1/2 in. o.d. ... 13 R.W.G.	11.70	10.23	\$9.72
1 3/4 in. o.d. ... 13 R.W.G.	13.42	11.64	11.06
2 in. o.d. ... 13 R.W.G.	15.03	13.04	12.38
2 1/4 in. o.d. ... 13 R.W.G.	16.76	14.54	13.79
2 1/2 in. o.d. ... 12 R.W.G.	18.45	16.01	15.16
2 3/4 in. o.d. ... 12 R.W.G.	20.21	17.54	16.58
2 1/2 in. o.d. ... 12 R.W.G.	21.42	18.59	17.54
3 in. o.d. ... 12 R.W.G.	22.48	19.50	18.35
3 1/4 in. o.d. ... 11 R.W.G.	28.37	24.62	23.15
4 in. o.d. ... 10 R.W.G.	35.20	30.54	28.66
4 1/4 in. o.d. ... 10 R.W.G.	43.04	37.35	35.22
5 in. o.d. ... 9 R.W.G.	54.01	46.87	44.25
6 in. o.d. ... 7 R.W.G.	82.93	71.96	68.14

Extras for less carload quantities:	Base
40,000 lb. or ft. over .....	5%
30,000 lb. or ft. to 39,999 lb. or ft. ....	10%
20,000 lb. or ft. to 29,999 lb. or ft. ....	15%
10,000 lb. or ft. to 19,999 lb. or ft. ....	20%
5,000 lb. or ft. to 9,999 lb. or ft. ....	30%
2,000 lb. or ft. to 4,999 lb. or ft. ....	45%
Under 2,000 lb. or ft. ....	65%

## CAST IRON WATER PIPE

### Per Net Ton

*6-in. and larger, del'd Chicago.	\$51.00
6-in. and larger, del'd New York	49.00
*6-in. and larger, Birmingham.	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles.	52.00
F.o.b. dock, Seattle .....	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles .....	55.00
F.o.b. dock, Seattle .....	52.00

Class "A" and gas pipe, \$3 extra 4-in. pipe is \$3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is \$42, Birmingham, and \$50 delivered Chicago and 4-in. pipe, \$45, Birmingham, and \$54 delivered Chicago.

## BOLTS, NUTS, RIVETS, SET SCREWS

### Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

### Per Cent Off List

Machine and carriage bolts:	
1/2 in. & 6 in. and smaller....	68 1/2
Larger and longer up to 1 in. ....	66
1 1/2 in. and larger.....	64
Lag bolts .....	66
Plow bolts, Nos. 1, 2, 3	
and 7 .....	68 1/2
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
1/2 in. and smaller.....	67
3/16 in. to 1 in. inclusive.....	64
1 1/2 in. and larger .....	62

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items, there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts U.S.S. S.A.E.	
1/2 in. and smaller ....	67 70
3/16 to 1 in. ....	64 65
1 1/2 in. and larger.....	62 62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, nuts attached .....	72 1/2
Stove bolts in packages, with nuts separate .....	72 1/2 and 12 1/2
Stove bolts in bulk .....	84

On stove bolts freight is allowed to destination on 200 lb. and over.

### Large Rivets

(1/2 in. and larger)

### Base Per 100 Lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham .....	\$3.40
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### Small Rivets

(7/16 in. and smaller)

### Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ....	65 and 10
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### Cap and Set Screws

(Freight allowed to destination)

### Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller.....	50 and 10
Milled headless set screws, cut thread 3/4 in. and smaller.....	70
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller .....	67 1/2
Upset set screws, cup and oval points .....	75
Milled studs .....	60

## Alloy and Stainless Steel

Alloy Steel Blooms, Billets and Slabs F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Base price, \$56.00 a gross ton.

### Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.	
Open-hearth grade, base .....	2.80c.
Delivered, Detroit .....	2.90c.
S.A.E. Alloy Series	
Numbers	Differential per 100 Lb.
200 (1/4% Nickel).....	\$0.35

2100 (1/4% Nickel) .....	\$0.75
2300 (3/4% Nickel) .....	1.55
2500 (5% Nickel) .....	2.25
3100 Nickel-chromium .....	0.70
3200 Nickel-chromium .....	1.85
3300 Nickel-chromium .....	3.80
3400 Nickel-chromium .....	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum) 0.55	
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum) 0.75	
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.) 1.10	
5100 Chrome steel (0.60-0.90 Cr.) 0.35	
5100 Chrome steel (0.80-1.10 Cr.) 0.45	
5100 Chromium spring steel.....	0.15
6100 Chromium-vanadium bar ..	1.20
6100 Chromium-vanadium spring steel .....	0.85
Chromium-nickel vanadium .....	1.50
Carbon-vanadium .....	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2 1/2 in. thick or over take the billet base.

### Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.40c. base per lb. Delivered Detroit, 3.50c., carlots.

## CORROSION & HEAT RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

### Chrome-Nickel

	No. 304	No. 302
Forging billets ....	21.25c.	20.40c.
Bars .....	25c.	24c.
Plates .....	29c.	27c.
Structural shapes .....	25c.	24c.
Sheets .....	36c.	34c.
Hot-rolled strip ..	23.50c.	21.50c.
Cold-rolled strip ..	30c.	28c.
Drawn wire .....	25c.	24c.

### Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Ears ..	18.50c.	19c.	22.50c.	27.50c.
Plates ..	21.50c.	22c.	25.50c.	30.50c.
Sheets ..	26.50c.	29c.	32.50c.	36.50c.
Hot Strip ..	17c.	17.50c.	23c.	28c.
Cold stp. ..	22c.	22.50c.	28.50c.	36.50c.

## TOOL STEEL

High speed .....	67c.
High-carbon-chrome .....	43c.
Oil-hardening .....	24c.
Special .....	22c.
Extra .....	18c.
Regular .....	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

## British and Continental BRITISH

Per Gross Ton f.o.b. United Kingdom Ports

Ferromanganese, export .....	Nominal
Tin plate, per base box.....	20s. 3d.
Steel bars, open hearth. £10 8s.	
Beams, open-hearth .....	£10
Channels, open-hearth ..	£10 5s.
Angles, open-hearth .....	£10
Black sheets, No. 24 gage. £13	
Galvanized sheets, No. 24 gage .....	£15 15s.

## CONTINENTAL

Per Gross Ton, Gold f., f.o.b. Continental Ports

Billets, Thomas .....	Nominal
Wire rods, No. 5 B.W.G. ....	£5 10s.
Steel bars, merchant .....	£5 5s.
Sheet bars .....	Nominal
Plate 1/4 in. and up.....	£5 7s.
Plate 3/16 in. and 5 mm. ....	£5 13s.
Sheets 1/4 in. ....	£5 9s. 6d.
Beams, Thomas .....	£4 18s.
Angles (Basic) .....	£4 18s.
Hoops and strip, base .....	£5 12s.



## RAW MATERIALS PRICES

### PIG IRON

#### No. 2 Foundry

F.o.b. Everett, Mass. ....	\$22.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md. ....	22.00
Delivered Brooklyn .....	24.50
Delivered Newark or Jersey City .....	23.53
Delivered Philadelphia .....	22.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown..	21.00
F.o.b. Buffalo .....	21.00
F.o.b. Detroit .....	21.00
Southern, delivered Cincinnati	21.06
Northern, delivered, Cincinnati	21.44
F.o.b. Duluth .....	21.50
F.o.b. Provo, Utah .....	19.00
Delivered, San Francisco, Los Angeles or Seattle .....	24.50
F.o.b. Birmingham*	17.38

\* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

#### Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

#### Basic

F.o.b. Everett, Mass. ....	\$21.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md. ....	21.50
F.o.b. Buffalo .....	20.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown..	20.50
Delivered Philadelphia .....	22.34
Delivered Canton, Ohio .....	21.89
Delivered Mansfield, Ohio .....	22.44
F.o.b. Birmingham .....	16.00

#### Bessemer

F.o.b. Buffalo .....	\$22.00
F.o.b. Everett, Mass. ....	23.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa. ....	23.00
Delivered Newark or Jersey City .....	24.53
Erie, Pa., and Duluth .....	22.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown ..	21.50
F.o.b. Birmingham .....	22.00
Delivered Cincinnati .....	22.11
Delivered Canton, Ohio .....	22.89
Delivered Mansfield, Ohio ..	23.44

#### Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y. ....	26.54
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#### Gray Forge

Valley or Pittsburgh furnace...	\$20.50
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#### Charcoal

Lake Superior furnace .....	\$25.00
Delivered Chicago .....	28.34

#### Canadian Pig Iron

##### Per Gross Ton

Foundry iron .....	\$24.50 base
Malleable .....	25.00 base
Basic .....	24.50 base

##### Toronto

Foundry iron .....	\$22.50 base
Malleable .....	23.00 base
Basic .....	22.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

### FERROALLOYS

#### Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

##### Per Gross Ton

Domestic, 80% (carload) .....\$80.00

#### Spiegeleisen

##### Per Gross Ton Furnace

Domestic, 19 to 21% .....\$28.00  
Domestic, 26 to 28% ..... 33.00

#### Electric Ferrosilicon

##### Per Gross Ton Delivered;

##### Lump Size

50% (carload lots, bulk) .....\$69.50\*  
50% (ton lots in 50 gal. bbl.)... 80.50\*  
75% (carload lots, bulk) .....126.00\*  
75% (ton lots in 50 gal. bbl.)...139.00\*

#### Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

##### Per Gross Ton

10.00 to 10.50% .....\$30.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, \$1 per ton additional. Phosphorus 0.75% or over, \$1 per ton additional.

Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

#### Silvery Iron

##### Per Gross Ton

F.o.b. Jackson, Ohio, 500 to

5.50% .....\$24.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed.

Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, \$1 a ton additional. Phosphorus 0.75% or over, \$1 a ton additional.

#### Ferrochrome

##### Per Lb. Contained Cr., Delivered

##### Carlots, Lump Size, on Contract

4 to 6% carbon .....10.50c.\*  
2% carbon .....16.50c.\*  
1% carbon .....17.50c.\*  
0.10% carbon .....19.50c.\*  
0.06 carbon .....20.00c.\*

#### Silico-manganese

##### Per Gross Ton, Delivered, Lump

##### Size, Bulk, on Contract

3% carbon .....\$83.00  
2.50% carbon ..... 88.00  
2% carbon ..... 93.00  
1% carbon .....103.00

#### Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads.... \$1.75

Ferrotungsten, 100 lbs. and less 2.00

Ferrovandium, contract, per lb. contained V., delivered .....\$2.70 to \$2.90†

Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., tons lots \$2.25†

Ferrocobaltitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract

per net ton .....\$142.50

Ferrocobaltitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract,

per net ton .....\$157.50

Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with \$3 unit-

age, freight equalized with Rockdale, Tenn., per gross ton .....\$58.50

Ferrophosphorus, electrolytic, 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn.,

24%, per gross ton, \$3 unit-

age, freight equalized with Nashville .....\$75.00

Ferromolybdenum, per lb. Mo. f.o.b. furnace ..... 95c.

Calcium molybdate, per lb. Mo. f.o.b. furnace ..... 80c.

Molybdenum oxide briquettes 48-52% Mo; per lb. contained Mo, f.o.b. Langeloth, Pa. .... 80c.

\* Spot prices are \$5 per ton higher.

† Spot prices are 10c. per lb. of contained element higher.

### ORES

#### Lake Superior Ores

##### Delivered Lower Lake Ports

##### Per Gross Ton

Old range, Bessemer, 51.50%...\$5.35  
Old range, non-Bessemer, 51.50% 5.10  
Messabi, Bessemer, 51.50% ..... 5.10  
Messabi, non-Bessemer, 51.50%.. 4.95  
High phosphorus, 51.50% ..... 4.85

#### Foreign Ore

##### C.i.f. Philadelphia or Baltimore

##### Per Unit

Iron, low phos., copper free, 55 to 58% dry, Algeria ..... 12c.

Iron, low phos., Swedish, average, 68½% iron ..... 12c.

Iron, basic or foundry, Swedish, aver. 65% iron ..... 11c.

Iron, basic or foundry, Russian, aver. 65% iron .....Nominal

Man., Caucasian, washed 52% ..... 23c.

Man., African, Indian, 44-48% ..... 25c.

Man., African, Indian, 49-51% ..... 23c.

Man., Brazilian, 46 to 48% ..... 27c.

##### Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered .....\$18.50

Tungsten, domestic, scheelite delivered .....\$16.00 to \$18.00

Chrome ore (lump) c.i.f. Atlantic Seaboard, per gross ton: South African

(low grade) .....\$15.00

Rhodesian, 45% ..... 19.00

Rhodesian, 48% ..... 22.50

Turkish, 48-49% ..... 22.50

Turkish, 45-46% ..... 19.00

Turkish, 40-44% ..... 17.00

Chrome concentrates (Turkish) c.i.f. Atlantic Seaboard, per gross ton:

50% .....\$25.00

48-49% ..... 23.50

### FLUORSPAR

##### Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois

mines, all rail .....\$17.00 to \$18.00

Domestic, f.o.b. Ohio River landing barges ..... 18.00

No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines ..... 18.00

Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f.

Atlantic ports, duty paid.... 21.50

Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not

over 2½% silicon, f.o.b. Illinois and Kentucky mines.... 31.50

### FUEL OIL

##### Per Gal.

No. 2, f.o.b. Bayonne..... 3.75c.

No. 6, f.o.b. Bayonne..... 2.26c.

No. 5 Bur. Stds., del'd Chicago. 3.25c.

No. 6 Bur. Stds., del'd Chicago. 2.75c.

No. 3 distillate, del'd Cleve'd.. 5.50c.

No. 4 industrial, del'd Cleve'd. 5.25c.

No. 5 industrial, del'd Cleve'd. 3.00c.

No. 6 industrial, del'd Cleve'd. 2.75c.

### COKE

##### Per Net Ton

Furnace, f.o.b. Connells-

ville, Prompt ..... \$3.75

Furnace, f.o.b. Connells-

ville, Prompt .....\$4.75 to 5.50

Foundry, by-product, Chicago ovens ..... 10.25

Foundry, by-product, del'd New England.... 12.50

Foundry, by-product, del'd Newark or Jersey City .....10.88 to 11.40

Foundry, by-product, Philadelphia ..... 10.95

Foundry, by-product, delivered Cleveland... 10.30

Foundry, by-product, delivered Cincinnati... 9.75

Foundry, Birmingham... 7.50

Foundry, by-product, del'd St. Louis industrial district .....10.75 to 11.00

Foundry, from Birmingham, f.o.b. cars dock

Pacific ports ..... 14.75

# IRON AND STEEL WAREHOUSE PRICES

## PITTSBURGH\*

	Base per Lb.
Plates	3.55c.
Shapes	3.55c.
Soft steel bars and small shapes	3.50c.
**Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.70c.
Hot rolled strip	3.75c.
Hot rolled sheets	3.50c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.50c.
Wire, black, soft annealed	3.15c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.60c.
Wire nails (in 100-lb. kegs)	2.65c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb.  
 \*\* On reinforcing bars base applies to orders of less than one ton and includes switching and carting charge.  
 \* All above prices for delivery within the Pittsburgh switching district.

## NEW YORK

	Base per Lb.
Plates, 1/4 in. and heavier	3.76c.
Structural shapes	3.75c.
Soft steel bars, round	3.94c.
Iron bars, Swed. char-coal	7.50 to 8.25c.
Cold-fin, shafting and screw stock:	
Rounds, squares, hexagons	4.14c.
Flats up to 12 in. wide	4.14c.
Cold-rolled strip, soft and quarter hard	3.66c.
Hot-rolled strip, soft O.H.	4.11c.
*Hot-rolled sheets (8-30 ga.)	3.40c.
Galv. sheets (24 ga.)	4.50c.
Long ternes (24 ga.)	5.50 to 6.20c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.60c.
Deep drawing	4.85c.
Stretcher leveled	5.10c.
SAE, 2300, hot-rolled	7.50c.
SAE, 3100, hot-rolled	6.10c.
SAE, 6100, hot-rolled annealed	10.25c.
SAE, 2300, cold-rolled	8.69c.
SAE, 3100, cold-rolled, annealed	7.29c.
Floor plate, 1/4 in. and heavier	5.43c.
Standard tool steel	12.50c.
Wire, black, annealed (No. 9)	4.65c.
Wire, galv. (No. 9)	5.00c.
Open-hearth spring steel	4.75c. to 10.25c.
Common wire nails, per keg in 25 keg lots	\$2.90

\*For lots less than 2000 lb.

## CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.60c.
Soft steel squares, hexagons, channels and Tees	3.75c.
Hot rolled strip	3.75c.
Floor plates	5.15c.
Hot rolled sheets	3.50c.
Galvanized sheets	4.50c.
Cold rolled sheets	4.45c.
Cold finished carbon bars	3.80c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

## CLEVELAND

	Base per Lb.
Plates	3.55c.
Structural shapes	3.73c.
Soft steel bars	3.50c.
Reinfor. bars (under 2000 lb.)†	2.55c.
Cold-fin. bars (1000 lb., over)	3.80c.
Hot-rolled strip	3.65c.
Cold rolled sheets	4.70c.
Cold-finished strip	3.35c.
Galvanized sheets (No. 24)	4.62c.
Hot-rolled sheets	3.50c.
Floor plates, 3/16 in. and heavier	5.33c.
*Black ann'd wire, per 100 lb.	\$3.10
*No. 9 galv. wire, per 100 lb.	3.50
*Com. wire nails, base per keg	2.60
Hot rolled alloy steel (3100)	6.05c.
Cold rolled alloy steel (3115)	6.85c.

\* For 5000 lb. or less.  
 † 500 lb. base quantity.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lb. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 399 lb. and under.

## ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.47c.
Bars, soft steel (rounds and flats)	3.72c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.87c.
Cold fin. rounds, shafting, screw stock	4.07c.
Galv. sheets (24 ga.)	4.53c.
Hot rolled sheets	3.53c.
Galv. corrugated sheets, 24 ga. and heavier*	4.53c.
Structural rivets	5.02c.

\* No. 26 and lighter take special prices.

## BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	5.85c.
Plates, 1/4 in. and heavier	3.85c.
Bars	3.98c.
Heavy hot rolled sheets	3.86c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.76c.
Galvanized sheets	4.76c.
Cold rolled sheets	4.93c.

The following quantity differentials apply: Less than 100 lb., plus \$1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.

## BUFFALO

	Base per Lb.
Plates	3.77c.
Floor plates	5.40c.
Struc. shapes	3.55c.
Soft steel bars	3.60c.
Reinforcing bars (20,000 lb. or more)	2.05c.
Cold-fin. flats, squares, rounds, and hex.	3.80
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl. also sizes No. 8 to 30 ga.	3.50c.
Galv. sheets (24 ga.)	4.50c.
Bands and hoops	3.97c.

## NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Boiler rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

## REFRACTORIES PRICES

Fire Clay Brick	
Per 1000 f.o.b. Works	
Super-duty brick, at St. Louis	\$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1, Ohio	39.90
Ground fire clay, per ton	7.10
Silica Brick	
Per 1000 f.o.b. Works	
Pennsylvania	\$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55
Chrome Brick	
Net per Ton	
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	\$47.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	47.00
Magnetite Brick	
Net per Ton	
Standard f.o.b. Baltimore and Chester	\$67.00
Chemically bonded, f.o.b. Baltimore	57.00
Grain Magnetite	
Net per Ton	
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	\$45.00
Domestic, f.o.b. Baltimore and Chester, in sacks	40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

## PHILADELPHIA

	Base per Lb.
*Plates, 1/4-in. and heavier	3.40c.
*Structural shapes	3.40c.
*Soft steel bars, small shapes, iron bars (except bands)	3.60c.
†Reinforc. steel bars, square and deformed	2.61c.
Cold-finished steel bars	4.11c.
*Steel hoops	4.10c.
*Steel bands, No. 12 and 3/16 in. incl.	3.60c.
*Spring steel	4.75c.
†Hot-rolled anneal. sheets	3.40c.
†Galvanized sheets (No. 24)	4.33c.
*Diam. pat. floor plates, 1/4 in.	5.00c.

These prices are for delivery in Philadelphia trucking area.

\* For quantities between 400 and 1999 lb.

†For 10 bundles or over.  
 †For one to five tons.

## BIRMINGHAM

	Base
Bars and bar shapes	\$3.85 base
Structural shapes and plates	3.75 "
Hot rolled sheets	
No. 10 ga.	3.80 "
Hot rolled sheets	
No. 24 ga.	4.40 " 3500 lb. and over
Galvanized sheets	
No. 24 ga.	5.05 " 3500 lb. or more
Strip	4.05 "
Reinforcing bars	3.85 "
Floor plates	5.96 "
Cold finished bars	4.91 "
Machine and carriage bolts	.50 & 10 off list
Rivets (structural)	\$4.60 base

On plates, shapes, bars, hot-rolled strip heavy hot-rolled sheets, the base applies on 400 to 3999 lb. All prices are f.o.b. consumer's plant.

## PACIFIC COAST

	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.60c.	4.00c.	3.40c.
Shapes, standard	3.60c.	4.00c.	3.40c.
Soft steel bars	3.65c.	4.00c.	3.65c.
Reinforcing bars, f.o.b. cars dock			
Pacific ports	2.275c.	open.	2.975c.
Hot-rolled sheets (No. 10)	3.60c.	4.20c.	3.95c.
Galv. sheets (No. 24 and lighter)	5.15c.	4.75c.	4.75c.
Galv. sheets (No. 22 and heavier)	5.40c.	4.75c.	4.75c.
Cold-finished steel			
Rounds	6.55c.	6.60c.	7.10c.
Squares and hexagons	7.80c.	7.85c.	7.10c.
Flats	8.30c.	8.35c.	8.10c.
Common wire nails—base per keg less carload	\$3.20	\$3.00	\$3.00

All items subject to differentials for quantity.

## ST. PAUL

	Base per Lb.
Mild steel bars, rounds	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

## DETROIT

	Base per Lb.
Soft steel bars	3.43c.
Structural shapes	3.80c.
Plates	3.75c.
Floor plates	5.42c.
Hot-rolled sheets, 8 to 30 gages above 12 in. and 3/16 in., 24 in. to 48 in. wide	3.58c.
Cold-rolled sheets	4.65c.
Galvanized sheets	4.74c.
Hot-rolled strip, under No. 12	3.83c.
Hot-rolled strip, No. 12 and over	3.58c.
Cold-finished bars	3.85c.
Cold-rolled strip	3.55c.
Hot-rolled alloy steel (SAE 3100 Series)	6.17c.

Quantity extras apply to all items.



# PLANT EXPANSION AND EQUIPMENT BUYING

## ◀ NORTH ATLANTIC ▶

**RCA Mfg. Co.**, 411 Fifth Avenue, New York, subsidiary of Radio Corp. of America, Inc., 30 Rockefeller Plaza, has let general contract to **J. L. Simmons & Co.**, Union Title Building, Indianapolis, for one-story and basement addition to branch plant at 501 North LaSalle Street, Indianapolis, 285 x 360 ft., for expansion in radio equipment assembling division; also for new power house, 46 x 80 ft. Cost over \$200,000 with equipment. **Albert Kahn, Inc.**, New Center Building, Detroit, is architect and engineer.

**Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet**, asks bids until April 11 for gages (Circular 174), 19,500 sq. ft. of steel fabric reinforcement (Circular 177); until April 12, 43 to 50 copper nickel alloy air cylinder forgings for 5-in. guns, and 43 to 50 copper nickel alloy plungers (Circular 179); until April 20, one portable air compressor (Circular 172).

**Texas Co.**, 135 East Forty-second Street, New York, plans central electric power plant at oil refinery at Port Arthur, Tex., with installation of three high-pressure boilers and accessories, steam turbo generator units and auxiliary equipment; also steel water tank for water supply for boilers. Cost close to \$1,000,000 with equipment. **Jackson & Moreland**, 31 St. James Avenue, Boston, are consulting engineers.

**Hub Paint & Varnish Corp.**, 7 Wythe Avenue, Brooklyn, has leased one-story building at Fifth Street and Forty-seventh Road, Long Island City, about 11,000 sq. ft. of floor space, for plant.

**Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn**, asks bids until April 14 for 100,500 ft. of cable and 35 reels (Circular 201); until April 17, electric motor-driven blower with switch and mounting fixtures (Circular 204).

**New York Central Railroad Co.**, 230 Park Avenue, New York, plans new one-story freight terminal at Thirty-second and Thirty-third Streets, between Eleventh and Twelfth Avenues. Cost over \$300,000 with mechanical-handling equipment, loaders, etc. **J. P. Gallagher**, address noted, is company engineer.

**Bureau of Yards and Docks, Navy Department, Washington**, asks bids (no closing date stated) for pumping equipment, piping systems and auxiliary equipment at Brooklyn Navy Yard (Specifications 9109).

**Board of Education, East Park, N. Y.**, plans manual training department in new three-story central junior and senior high school, for which general contract has been let to **William A. Berbusse, Jr., Inc.**, 101 Park Avenue, New York, at \$364,900 exclusive of equipment.

**Quartermaster, West Point, N. Y.**, asks bids until April 14 for one shaper, drill press, 12-in. lathe, woodworking bandsaw, table saw, saw filing machine, thickness planer and 6-in. belt sander, all motor-driven (Circular 955-55).

**Bureau of Supplies and Accounts, Navy Department, Washington**, asks bids until April 11 for ventilation equipments and spare parts (Schedule 5940); until April 14, chains and sprockets for ammunition hoists (Schedule 5954), steel valves (Schedule 5965) for Brooklyn and Philadelphia Navy yards; motor-driven vertical spindle surface grinder (Schedule 5973), 300 aircraft altimeters and spare parts (Schedule 5966), motor-driven trimming press (Schedule 5986) for Philadelphia yard.

**Benn Supply Co.**, 451 Communipaw Avenue, Jersey City, N. J., distributor in metropolitan area for **Jones & Laughlin Steel Corp.**, has purchased a one-story building on adjoining site, about 30,000 sq. ft. of floor space, for expansion. This follows purchase last January of two-story structure at first noted address,

formerly plant of **American Musical Wire Co.**, and removal from 556-58 Montgomery Street to that location.

**West Portal Mines, Inc.**, West Portal, N. J., **Anthony M. Hauck, Jr., Clinton, N. J.**, representative, recently organized, has acquired iron mines in Jugtown Mountain district, near West Portal, idle for many years, and will equip properties for early operation, including installation of electric haulage equipment, safety apparatus and mining facilities. Property will be developed to give employment to over 200 operatives. New company is headed by **Willmot D. Cloos, Lake Ariel, Ariel (Wayne County), Pa.**, and **Clifton B. English, Easton, Pa.** **Harry M. Roche** is consulting engineer in charge.

**Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia**, asks bids until April 12 for one 1½-in. automatic, multiple spindle machine for 37-mm. shells (Circular 917).

**Quartermaster Depot, Twenty-first and Johnston Streets, Philadelphia**, asks bids until April 10 for 250 kegs of wire nails (Circular 669-173).

## ◀ NEW ENGLAND ▶

**United Aircraft Corp.**, East Hartford, Conn., has let general contract to **R. G. Bent Co.**, 93 Edwards Street, Hartford, for one-story addition to local plant of **Chance Vought Aircraft Division**, to be occupied by **Hamilton Standard Propellers Division** in future. Cost close to \$80,000 with equipment, including improvements in present plant unit. **Albert Kahn, Inc.**, New Center Building, Detroit, is architect and engineer. As recently noted, **Chance Vought Division** is to be removed to **Stratford, Conn.**, where addition will be built to present **Sikorsky Aviation Division** works. Cost over \$200,000 with equipment. Same architect in charge.

**Bureau of Supplies and Accounts, Navy Department, Washington**, asks bids until April 11 for planer-type milling machine (Schedule 5956) for **Portsmouth, N. H., Navy Yard**; until April 14, plate shear and one turntable (Schedule 5972), one plate punch (Schedule 5962) for **Boston yard**, all motor driven; four electric-hydraulic windlasses, with spare parts (Schedule 5918) for **Boston, Charleston and Puget Sound yards**.

**Mason & Parker Mfg. Co.**, Winchendon, Mass., mechanical and other toys, plans rebuilding plant at **South Royalston, Mass.**, recently destroyed by fire. Loss over \$200,000 with equipment.

**Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass.**, asks bids until April 12 for one semi-automatic universal thread milling machine (Circular 356); until April 14, two automatic milling machines (Circular 371), all motor-driven.

## ◀ WASHINGTON DIST. ▶

**Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md.**, asks bids until April 15 for steel strapping and 10,000 metal seals (Circular 307); until April 26, one motor-driven combination, contour sawing, filing and polishing machine, and one grinder drill, built-in motor type, capacity 1/16 to 6-in. twist drills (Circular 317).

**Bureau of Yards and Docks, Navy Department, Washington**, asks bids (no closing date stated) for two 25-ton and one 15-ton gasoline-electric traveling hammerhead cranes for **Norfolk Navy Yard, Va.**; alternative bid for diesel-electric cranes (Specifications 8938).

**General Purchasing Agent, Panama Canal, Washington**, asks bids until April 11 for galvanized wire rope clips, galvanized iron or steel screw pin chain shackles, manganese

bronze welding rods, welding electrodes, malleable iron pipe fittings, brass or bronze pipe fittings, railing fittings, gate and globe valves, 10,000 lin. ft. galvanized steel wire poultry netting, galvanized steel wire cloth and other equipment (Schedule 3438).

**Charles T. Brandt, Inc.**, Bush and Ridgely Streets, Baltimore, sheet metal products, has let general contract to **George S. Awalt & Co.**, 718 Hunting Place, for one-story addition, 125 x 250 ft. Cost about \$50,000 with equipment. **Lucius R. White, Jr.**, 10 West Chase Street, is architect.

**Bureau of Supplies and Accounts, Navy Department, Washington**, asks bids until April 18 for two 40-ton oil-burning, steam locomotives for **Boston Navy Yard**; one 40 to 45-ton steam-operated, fireless locomotive for **Charleston yard**; two 60-ton and four 50-ton diesel-electric locomotives for **Mare Island yard**; one 50-ton oil-burning, steam locomotive and five 50-ton diesel-electric locomotives for **Norfolk yard**; one 50-ton gasoline-electric and four 50-ton diesel-electric locomotives for **Philadelphia yard** (Schedule 5882); one motor-driven universal grinder and equipment (Schedule 5945) for **Washington yard**.

## ◀ BUFFALO DISTRICT ▶

**Eastman Kodak Co.**, **Kodak Park, Rochester, N. Y.**, has let general contract to **Ridge Construction Co.**, **Kodak Park**, for five-story addition. Cost over \$125,000 with equipment. A smaller one-story extension will be erected also by same contractor, to cost in excess of \$40,000 with equipment.

**American Brake Shoe & Foundry Co.**, **Niagara Falls, N. Y.**, has arranged for purchase of plant and business of **Kellogg Compressor & Mfg. Corp.**, 97 Humboldt Street, **Rochester, N. Y.**, air compressors, pneumatic auto lifts, parts, etc., and will operate as **Kellogg Division** of company. Production facilities will be arranged at switch and frog plant of purchasing company, first noted address, where manufacture will be concentrated in future, following early removal from **Rochester**. Main offices are at 230 Park Avenue, **New York**.

## ◀ SOUTH ATLANTIC ▶

**Nehi Bottling Co.**, **Durham, N. C.**, has filed plans for new one-story mechanical-bottling plant, for which superstructure will begin at once. Cost about \$50,000 with equipment.

**Bureau of Yards and Docks, Navy Department, Washington**, asks bids until April 19 for one 30-ton electric traveling crane, hammerhead type (Specification 8991); also bids (no closing date stated) for one 25-ton revolving crane, diesel-electric, with alternative bid for gasoline-electric crane (Specifications 8992), both for **Charleston, S. C., Navy Yard**.

## ◀ OHIO AND INDIANA ▶

**Allied Oil Co., Inc.**, **Standard Building, Cleveland**, has let general contract to **American Construction Co.**, **Marion Building**, for new bulk oil storage and distributing plant on waterfront at **Toledo**, including dock and other operating facilities. Cost close to \$100,000 with equipment.

**Fischer Bakery**, 3021 Colerain Avenue, **Cincinnati**, plans one-story addition, 120 x 400 ft. Cost over \$100,000 with traveling ovens, mixers, conveyors and other mechanical equipment. **J. R. Biedinger, Traction Building**, is consulting engineer.

**Capitol Mfg. & Supply Co.**, 668 Raymond Street, **Columbus, Ohio**, pipe fittings, nipples, etc., has let general contract to **F. & Y. Construction Co.**, 328 East Town Street, for one-story plant unit, 90 x 120 ft., at 153 West **Fulton Street**. Cost about \$50,000 with equipment.

**Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio**, asks bids until April 10 for corrosion-resistant steel cotter pins, steel cotter pins, taper pins, expansion plugs, etc. (Circular 830), motor-generator set (Circular 864), hose assemblies (Circular 865), couplings and gaskets (Circular 861).

**United States Army Air Corps, Wright Field, Dayton, Ohio**, is completing plans for



one-story engineering laboratory, 140 x 180 ft., with dynamometer testing and research, torque stands, etc. Cost over \$100,000 with equipment; also for one-story addition, 45 x 200 ft., to propeller laboratory. Cost about \$150,000 with equipment. Construction Quartermaster at field is in charge.

**Central Soya Co., Decatur, Ind.,** has let general contract to Indiana Engineering & Construction Co., Old First Bank Building, for one-story addition to soybean processing plant, 150 x 300 ft., for storage and distribution, with bulk meal storage tanks and other equipment. Cost close to \$75,000.

## ◀ WESTERN PA. DIST. ▶

**H. J. Heinz Co., 1062 Progress Street, Pittsburgh,** food packer and canner, has asked bids on general contract for one and two-story factory branch, storage and distributing plant, 80 x 175 ft., at Mulberry and Seventeenth Streets, Harrisburg, Pa. Cost close to \$65,000 with equipment. B. E. Starr, 7 South Second Street, Harrisburg, is architect.

**Carnegie Coal Corp., Oliver Building, Pittsburgh,** plans rebuilding tipples at mining properties at Oakdale, Pa., recently partially destroyed by fire.

**Louis Marx & Co., Glendale, near Wheeling, W. Va.,** mechanical toys, have let general contract to Gillmore-Carmichael-Olson Co., 1873 East Fifty-fifth Street, Cleveland, for one-story addition, about 60,000 sq. ft. of floor space. An overhead traveling crane will be installed. Cost close to \$150,000 with equipment. Main offices are at 200 Fifth Avenue, New York.

## ◀ MIDDLE WEST ▶

**Chicago Flexible Shaft Co., 5600 West Roosevelt Road, Chicago,** flexible shafts, domestic electric appliances, etc., will take bids soon on general contract for three-story and basement addition, 46 x 365 ft., with foundations for three additional stories later, for storage, distribution and other service. Cost over \$75,000 with equipment. Olsen & Urbain, 228 North LaSalle Street, are architects.

**Peter Fox Brewing Co., 2626 West Monroe Street, Chicago,** has let general contract to Richard H. Clemence & Co., 53 West Jackson Boulevard, for one-story addition, 98 x 100 ft., for storage and distribution. Cost about \$45,000 with equipment. R. S. Frodin, 410 South Michigan Avenue, is architect.

**United States Engineer Office, Post Office Building, Chicago,** asks bids until April 12 for two clamshell buckets (Circular 117).

**Town Council, Hartley, Iowa,** asks bids until April 25 for extensions and improvements in municipal electric power plant, including new 450-hp. diesel engine-generator unit and auxiliary equipment. Gwen Guenther is town clerk in charge.

**International Harvester Co., 180 North Michigan Avenue, Chicago,** has asked bids on general contract for one-story addition to farm tractor plant at Rock Island, Ill., 162 x 360 ft. Cost over \$250,000 with machinery. O. A. Krueger is chief engineer, first noted address.

**United States Engineer Office, Commerce Building, St. Paul, Minn.,** asks bids until April 25 for pumping machinery and accessories for water service at locks and dams Nos. 3, 7 and 9, Mississippi River (Circular 105).

**Board of Trustees, Water and Light Plant, Villisca, Iowa, C. G. Hilleary, secretary,** asks bids until April 18 for extensions and improvements in municipal electric plant, including two new diesel-electric generating units, 800 and 675-hp., respectively, and auxiliary equipment. A. S. Harrington, Baum Building, Omaha, Neb., is consulting engineer.

**Commanding Officer, Ordnance Department, Rock Island Arsenal, Rock Island, Ill.,** asks bids until April 10 for one set of jig boring tools, end milling cutters, end milling cutter chucks, vernier depth gages, vernier height gages, cutters, etc. (Circular 637).

**Acme Galvanizing, Inc., Milwaukee,** plant of which at 906 East Bay Street, was destroyed by fire Dec. 30, has purchased buildings at

South Nineteenth Street and West Cleveland Avenue, Milwaukee, formerly occupied by South Side Malleable Castings Co., and will remodel 17,650 sq. ft. of floor space for occupancy by May 1, with 13,400 sq. ft. available for future use. New equipment will be installed. In addition to doing custom galvanizing, solder dipping, cadmium plating, etc., it will start new line of hard chrome plating. I. M. Herrmann is president.

**Whiting-Plover Paper Co., Route 1, Stevens Point, Wis.,** has placed general contract with C. R. Meyer & Sons Co., 50 State Street, Oshkosh, Wis., for alterations in and enlarging building No. 4 at cost of about \$50,000.

**Universal Atlas Cement Co., 208 South La Salle Street, Chicago,** has started work on cement packing and sack storage addition to branch plant at Green Bay, Wis., costing about \$50,000. S. J. Robinson is chief engineer.

**Tri-State Power Co., Platteville, Wis.,** will start work soon on \$500,000 steam generating plant near Genoa, Wis., as Wisconsin Development Authority project. E. J. Stoneham, Platteville, is president.

## ◀ SOUTHWEST ▶

**Seven-Up Oklahoma City Co., 624 N. W. Second Street, Oklahoma City,** has let general contract to John Putney, 221 N.W. Twenty-second Street, for new two-story mechanical-bottling works, 50 x 100 ft., at 517-23 Walker Street. Cost close to \$50,000 with equipment.

**Quartermaster, CCC, Little Rock, Ark.,** asks bids until April 10 for drill press, shaper, jointer, saws and other tools (Circular 5705-83).

**Board of Directors, Grand River Dam Authority, City Hall, Vinita, Okla.,** asks bids until April 11 for new pumping plant for Vinita waterworks system. Holway & Neuffer, 302 East Eighteenth Street, Tulsa, Okla., are consulting engineers.

**City Council, McPherson, Kan.,** asks bids until April 10 for cooling tower, boiler feed pump and auxiliary equipment for municipal electric power plant. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

**Quartermaster, CCC, Oklahoma City,** asks bids until April 10 for drill press, shaper, grinder, sander and other tools (Circular 5808-48).

**Farmers Elevator Co., Marshall, Okla.,** plans new grain elevator, for which fund of about \$100,000 is being arranged. Cost estimated at that amount, including conveying, elevating, screening and other mechanical equipment.

**Lower Colorado River Authority, Littlefield Building, Austin, Tex.,** asks bids until April 28 for hydraulic turbines and governors, electric generators and auxiliary equipment for new hydroelectric power plant at Marshall Ford dam.

**National Aircraft Corp., San Antonio, Tex., John B. Miller, vice-president and general manager,** recently organized to succeed National Aircraft Co., has acquired about 63 acres near city for plant for manufacture of airplanes. It will comprise several one-story units for parts production and assembling. Cost close to \$200,000 with equipment.

## ◀ MICHIGAN DISTRICT ▶

**Frankenmuth Brewing Co., Frankenmuth, Mich.,** has purchased former plant of Kentucky Brewing Co., Inc., 1445 South Fifteenth Street, Louisville, idle for several months, and will modernize for branch plant for brewing, bottling, storage and distribution.

**United States Engineer Office, Federal Building, Detroit,** asks bids until April 10 for one survey type stream gaging crane and protractor (Circular 42).

**Ex-Cell-O Corp., 1200 Oakman Boulevard, Detroit,** precision boring machines, thread grinders, etc., has let general contract to Austin Co., Curtis Building, for one-story addition. Cost over \$45,000 with equipment.

**Public Buildings Branch, Treasury Department, Washington,** plans new two-story service, repair and garage building at Marantette and Fourteenth Avenues, Detroit, for post office department, with facilities for han-

dling 135 motor trucks and cars. Machine and repair shops will be installed on second floor. Erection is scheduled to begin this summer. Cost about \$700,000 with equipment.

## ◀ SOUTH CENTRAL ▶

**Tennessee Coal, Iron & Railroad Co., Birmingham,** plans extensions and improvements in iron ore mining properties at Red Mountain, near Bessemer, Ala., including new sintering plant, modernization in ore-crushing department and other divisions. Cost over \$500,000 with equipment.

**Mississippi River Commission, Vicksburg, Miss.,** asks bids until April 11 for eight centrifugal pumping units (Circular 18).

**Grocers Baking Co., 1455 South Seventh Street, Louisville,** will ask bids soon on general contract for one-story addition to branch plant at Lexington, Ky. Cost close to \$60,000 with ovens, mixers and other equipment. H. A. Churchill & Associates, Citizens' Building, Lexington, are architects.

**Southdown Sugar Refinery, Houma, La.,** has approved plans for rebuilding part of cane sugar refinery on Bayou Black, destroyed by fire about three months ago with loss of about \$500,000 including equipment. Work will begin soon. Property is owned by Realty Operators, Inc., Marine Building, New Orleans.

## ◀ PACIFIC COAST ▶

**Northrop Aircraft, Inc., 6824 McKinley Avenue, Los Angeles,** has acquired about 20-acre tract near airport at Long Beach, Cal., for new plant. Initial unit will total about 100,000 sq. ft. of floor space, for parts production and assembling. Cost over \$400,000 with machinery. John K. Northrop is president.

**Bureau of Yards and Docks, Navy Department, Washington,** plans new trade school at naval training station, San Diego, Cal. Work will be carried out in conjunction with other new buildings, for which gross fund of \$525,000 is being arranged, including equipment. Also plans new power plant to cost about \$50,000, and torpedo storehouse and accessories to cost \$90,000, at destroyer base, San Diego. Proposed to ask bids soon.

**Columbia Steel Corp., Third Street South and Lander Street, Seattle,** plans one-story addition, 76 x 415 ft., to be divided into two bays, for storage and distribution. An overhead electric traveling crane will be installed. Cost close to \$100,000 with equipment. Main offices are in Russ Building, San Francisco.

**Solar Aircraft Co., 1212 West Juniper Street, San Diego, Cal.,** plans one-story addition, 170 x 180 ft., for parts production and assembling. Cost over \$85,000 with equipment.

**Bureau of Supplies and Accounts, Navy Department, Washington,** asks bids until April 14 for one electric-hydraulic steering gear, with mechanical and electrical spare parts (Schedule 5927); until April 18, two boat and airplane crane equipments, with revolving platforms, mechanical and electrical spare parts (Schedule 5961); until April 21, eight oil purifiers and spare parts (Schedule 5977), rough machined steel forgings (Schedule 5969) for Mare Island Navy Yard; until April 18, gasoline engine-driven, wheel-type tractor crane (Schedule 5948) for Point Loma, Cal.; motor-driven cylindrical grinding machine (Schedule 5952) for Puget Sound yard.

## ◀ FOREIGN ▶

**Simmonds Aerocessaries (Western), Ltd., Great North Road, near Brentford, England,** manufacturer of aircraft equipment and accessories, plans one-story addition to branch plant at Treforest, near Cardiff, England, totaling about 60,000 sq. ft. of floor space. Cost over \$175,000 with equipment. Company also plans early expansion at same works, for gross plant area of about 200,000 sq. ft.

**North Wales Carbide Corp., Mostyn, Flintshire, Wales,** has begun construction of new plant for production of carbide and chemical specialties, to give employment to about 1500 persons. Cost over \$3,000,000, of which close to \$1,500,000 will be expended for equipment. Contracts for latter will be placed in next 30 to 60 days.

# THIS WEEK'S MACHINE ...TOOL ACTIVITIES...

## Active Buying Continues in New York Metropolitan Area

**N**EW YORK—All classes of sellers report a revival of business in the past few weeks, and from all indications March sales volume will be the best for any month since late 1937. What lends particular encouragement to dealers and factory representatives is the fact that orders are coming in from sources dormant for some time. Some of the business placed, also, was based on quotations originally made two to three years ago. Meanwhile, there is no let-up in buying

activity on the part of the aircraft engine and parts companies, which continue to expand their capacity.

## Broad Inquiries in Detroit; Order Volume Spotty

**D**ETROIT—The machinery business in this area continues to be spotty with inquiries numerous but widely scattered, and for only small quantities or single units. A contemplated expansion program by Ohio Steel Foundry Co. will require equipment for a machine shop, it is understood. Demand for welding equipment

seems to be particularly healthy in the vicinity of Detroit. Pontiac is making inquiries which indicate that the plant will buy considerable transmission manufacturing equipment, particularly gear chamfering machines. The extent of the program has not been revealed.

## Slow Closing of Potential Business in Cleveland

**C**LEVELAND—Potential business is extensive, but difficulty in closing local propositions is reported by most machine tool dealers. Activity apparently is more brisk in the East and around Detroit than it is in this district.

Producers continue operating at a very comfortable level. On certain items, dealers report that deliveries remain extended. One down-state manufacturer is reported to have recently sublet production of some of his parts.

## Current Orders Much Lower Than Quotation Volume

**C**HICAGO—The machine tools being ordered today give no indication whatever of the considerable volume of business upon which quotations have been made, and which doubtless will become orders should general conditions show signs of definite and long-lived improvement. As long as this large amount of potential business exists and is increased week by week, many sellers cannot help feeling optimistic, though current orders are not numerous. March bookings in one sales agency equaled those of February, thereby beating all months since September, 1937. Good demand has been reported for gear cutting machinery and large horizontal boring machines. Additional inquiries are emanating from the International Harvester Co., which will soon be tooling for a tractor engine at Milwaukee. Some orders may be seen soon from the arsenal at Rock Island, Ill.

## No Change in Order Volume Reported at Cincinnati

**C**INCINNATI — The local machinery market leveled off the past week, with ordering about equal to that of the previous week. Manufacturers feel the situation is unchanged and that on the basis of prospects an upward swing is reasonably certain in the ensuing weeks. This is based on the good run of inquiry which flows steadily into local offices. Current business is retaining a stronger domestic appearance, although foreign ordering continues to be good. New business is largely in single unit quantities for light machines. The bigger types, however, are not without interest, so that the present market demand is well rounded.

## Government Buying for Both Arsenals and Navy Yards

**B**OSTON—The War Department has purchased an electric spot welding machine from the Thomson-Gibb Electric Welding Co., Lynn, Mass., for the Watertown, Mass., arsenal at a cost of \$3,083.

Bureau of Supplies and Accounts, Navy Department, Washington, is taking bids until April 11, Schedule No. 5930, for motor driven heavy duty lathes on a cost basis delivered Portsmouth, N. H., Navy yard.



*Lima crane on 6th Ave. "L" demolition job*

**N**EW Lima type 34 Paymaster truck crane shown being used by the Harris Structural Steel Co., Inc., in demolishing the old Sixth Avenue "L" in New York. Some of the trusses on this job weigh  $4\frac{1}{2}$  tons and in some instances it was necessary to operate the machine at 35 to 40-ft. radius. The truck mounting is a new development of the Shovel and Crane Division of the Lima Locomotive Works, Inc., Lima, Ohio. Power plant is a six-cylinder gasoline engine,  $4\frac{3}{8} \times 4\frac{3}{4}$  in., with silent chain drive to jackshaft. General design embodies anti-friction bearings at all vital bearing points, including the drums. Weight is kept to a minimum through the use of high tensile steels and placing the machinery to extreme rear of revolving frame for balancing the load. Rotating frame is cast in one piece and is held to the turntable by hook rollers which rotate between a double integral roller path.



# Role Played by Gas Reviewed

(CONTINUED FROM PAGE 49)

protecting steel during heating from undesirable attack, such as scaling or carburization or decarburization, as follows: Mechanical protection in absence of any gas; use of an inert gas like pure nitrogen or helium; additions of small amounts of a reactive gas to overcome the bad effects of impurities in commercial nitrogen; use of cracked ammonia or similar hydrogen gas; use of charcoal generator gas or gas high in carbon-monoxide; use of partly burned natural or city gas, propane, butane and the like, after removing undesirable constituents; preparation of various protective special gases as by cracking methanol vapor or other hydrocarbons.

Taking up the above points in more detail he continued:

Heating in an effective vacuum can be done but is applicable only to special work that can stand a relatively high cost treatment. Coating with a layer of other material to exclude contact with the atmosphere has been successful only in limited way. Painting or immersion in a suspension of fine powder is not entirely protective.

Really pure dry nitrogen would be excellent as an inert atmosphere if it could be kept pure. Helium or other inert gases do not always meet expectations in producing no action whatever on the steel. With a slight amount of a reducing gas, such as hydrogen or carbon-monoxide, to take care of residual oxygen in any form, however, such inert gases form excellent protective atmospheres.

It is possible by carefully controlling the combustion of fuel gases to remove substantially all the carbon monoxide and hydrogen, without introducing free oxygen into the gas. Then by removing the water vapor and absorbing the carbon dioxide, nearly pure nitrogen is obtainable at a relatively low cost.

Pure hydrogen is effectively used in the heat treatment of many metals, but it is decarburizing to carbon steels, particularly if moisture is present. Under most conditions, cracked ammonia is just as good and much cheaper. One of its advantages is stability: the composition does not vary and uniform conditions can be readily maintained.

An effective protective atmosphere that is becoming of increased importance, is formed by passing air through hot carbon. The decarburizing effect of small amounts of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  can be overcome by adding methane, but changes are rather sensitive and a non-reactive atmosphere is not effective for a very wide range of steels.

The most widely used and cheapest atmosphere for heat treating steel is, of course, partly burned natural or city gas or propane, butane and the like. Dried, partially burned gas at-



L. O. HOWELL  
in his paper described the combustion  
of natural and coke oven gas under  
reducing conditions.

mospheres, are excellent for such operations as annealing low carbon steel where the temperature rarely goes over 1400 deg. F. and decarburization is not a serious problem. In heat-treating medium and high carbon steels, particularly at higher temperatures, however, drying alone has not been satisfactory except possibly for very short treatments. With a dry, relatively  $\text{CO}_2$  free gas it is possible to adjust by addition of  $\text{CH}_4$  or its equivalent to overcome any decarburizing tendency.

Discussing special atmospheres, Dr. Gonser said methanol may be vaporized to form an atmosphere high in  $\text{H}_2$  and  $\text{CO}$  which is protective for fairly short treatments but is strongly decarburizing for high carbon steels held a longer time at a higher temperature. Contamination with mois-

ture is to be guarded against. Oil vapor is a desirable atmosphere for treating high carbon steel, and raw natural or other gases may also be used if soot deposition is not objectionable. Short treatments at comparatively low temperatures under these conditions prevent excessive carburization.

Taking up alloy steels, he pointed out that in general the carbon content of a steel is its criterion of behavior in a furnace gas, regardless of its alloying constituents, this applying only to low alloy steels and those relatively free from chromium and silicon. Chromium steels of approximately one per cent Cr or over are very easily stained. Steels containing silicon, at least when present to the extent of two per cent, resist carburization or decarburization much more than do plain carbon steels.

A paper by L. O. Howell, industrial engineer A.G.A. Testing Laboratories, Cleveland, described recent investigations of the combustion of natural and coke oven gas under reducing conditions, conducted at the Cleveland testing laboratory, under the auspices of the Association's Industrial Gas Research Committee. Preliminary results indicate that the composition of the flue gases resulting from such combustion varies with changes in flue gas temperature.

The possibilities of controlling the ratios of  $\text{CO}_2$  and  $\text{CO}$  in the flue gas, whatever the degree of aeration of input gas, was indicated in a test case that showed the effect of sudden cooling. The chemical composition desired, within the range of possible temperatures may be obtained by rapid cooling which will "quench" the gases from any desired temperature. In the test case the gases were quenched from 2800 deg. F. to produce the  $\text{CO}$  to  $\text{CO}_2$  ratio which would normally be characteristic of 1750 deg. F. More rapid cooling or slower cooling could be used to produce mixtures characteristic of other temperatures.

The fundamentals of application of heated air to convection heating furnaces are rapidly assuming shape where they can be bracketed, said Edward Stephenson, Jr., Surface Combustion Corp., whose technical paper was titled "Recirculating Air Heating for Industrial Furnaces."

Both the user and the furnace manufacturer should be in agreement upon fundamentals such as the furnace structure and linings; conveyor, fans and burner equipment; temperature control and application of heat.



Taking up the above points in detail, Mr. Stephenson's paper brought out the following thoughts:

The tendency of modern furnace structure has been toward steel. Many types of linings are offered for furnaces in the low temperature realm from 1250 deg. F. down, each of which has its place. Various types of conveying mechanisms are available, the fundamental point of consideration being that the ratio of the net weight to be treated plus conveyor to be heated to the net weight only shall be as close to unity as possible.

A fundamentally good heater is one which has minimum storage, that is, the amount of heat to bring the heater to temperature is at a minimum. Heaters should be readily accessible, totally inclosed and should be constructed so that their life is at least as long, if not longer than, the life of the furnace shell.

Compactness is desired to fit within relatively narrow confines. Heaters should also be efficient from the angle of heating medium. They usually should permit the use of a blow-through system in which air or gases are pushed through the heater and then down into the furnace chamber. The heater may be built within the furnace chamber, but at the present time the trend apparently is to the external heater which lends itself to the solution of problems at present more easily than the composite built-up system.

Burner equipment should be of such a type that it is able to completely burn the type of fuel specified with automatic proportioning between air and fuel. Automatic ignition should be afforded, and complete piping. Burner equipment should be of such design that by control of one valve, either air or gas, the quantity of fuel is admitted in correct ratios. The ratio or carburetion of the air-gas mixture should be uniform over the ranges of volume desired to permit maximum combustion efficiency.

Inspirator and burners should be designed for easy servicing and so that a change in fuel can be met with a minimum of changes in the carburetor and burners. After the designer has considered these points he must also correlate his firing systems to fit his heaters. A correctly tailored firing system plays a vital part and must be given most careful consideration.

The fan or fans which are used should be of a type to give maximum velocity, consistent with good heat practice and minimum power input.



**BRUCE W. GONSLER**

author of the paper "The Present Status of Prepared Atmospheres in Industrial Heating."

They should also be of a style and type which gives minimum of cooling and long life without maintenance.

The temperature control equipment can be of any of the well known types which are available. It is recommended where possible that the temperature control itself be of the throttling type.

The safety control should be prepared to shut down the unit in the event of power failure, slippage of the belt on circulating fan, failure of combustion air, failure of the gas being fed to the system, failure of the pilot to remain lighted, or the flame within the heater to remain lighted. Safety control equipment does not have to be sensitive to fluctuations, for instance on the pilot gases or in the combustion air, but should any of these completely fail, it must be in a position to shut down immediately.

#### Various Flow Theories

In examining the application of heated air to the work to be heated, the design engineer has available several methods to employ, regardless of whether the furnace be of the continuous conveyor or batch type. He can put all heat in at the top and pull it all back at the bottom, or he can put it in all at the bottom and take it out on top, or he can split it, putting part in at the bottom and part at the top, and take out at the top or bottom as desired. It would appear obvious that

with heat applied top and bottom, the heating time will be reduced. This is a fundamental of high temperature furnaces recognized for years, so that it appears that the splitting of air to be supplied to the heating chamber is of advantage unless other considerations enter into the problem.

The theory of flow of heated gases across surfaces resolves itself into several forms. These are the streamlined flow, lamellar flow, viscous flow, and turbulent flow. In the majority of cases these flows can be identified by the velocity or movement of gases. The fundamental principle of convection heating furnaces is to put a film of hot gases around the work and wipe that film off as soon as the heat is abstracted from the film. The greater rapidity with which this takes place the greater the heat transmission. Therefore, due consideration should be given whether proper study has been made of the proper kind of flow in relation to the objects to be heated. Study also should be given to the point whether on extremely thick loadings there is penetration down into the load.

Under properly selected and designed applications, luminous flame combustion results in an increased rate of heat transfer as compared to non-luminous flame, due to the radiating power of incandescent carbon particles, said James E. Dare, Public Service Co. of Northern Illinois, Streator, Ill., in a paper titled "Luminous Flame and Its Application".

Other advantages include more uniform temperature control, less maintenance of furnace refractories, greater degree of turn-down of burners, and formation of scale which requires less trouble to remove, as well as reduction in the amount of scale.

Luminous flames, which are caused by admitting very little or no primary air to the burner, have been applied in the steel industry for heating stock for the rolling mill; heating stock for forging; in soaking pits and open-hearth; heating for annealing, normalizing and hardening, and miscellaneous high temperature steel processing. Other applications include side fired galvanizing tanks, lead melting pots and frit furnaces. There are numerous applications in the glass industry.

Research has shown, said Mr. Dare, that for certain high temperatures a fast rate of heat transfer could be obtained from luminous flame, even though maximum temperatures were lower than non-luminous flames. He



**JAMES E. DARE**

who presented a paper entitled "Luminous Flame and Its Application."

described the radiation power of a luminous flame as being about four to six times as great as a non-luminous flame of the same temperature.

Discussing formation of scale, the author asserted that with the luminous flame nascent oxygen is not produced in appreciable quantities and with the rate of heat transfer depending almost entirely on radiation, scale formation is reduced. The type of scale formed is soft and easily removed.

Furnaces should be sufficiently well constructed to minimize air infiltration, and the combustion volume should be sufficiently large to minimize turbulence. This type of combustion should be applied where a short flame cannot distribute the heat properly due to the extreme width or length of the furnace.

Burners rated at a minimum of 250 cu. ft. per hr. (natural gas 1000 B.t.u. per cu. ft.) to burners rated at a maximum of 12,000 cu. ft. per hr. are available. Most of the burners have a maximum turndown of 20 to 1.

In general, said Mr. Dare, air and gas pressure from 3 in. to 14 in. of water column are required for the various burners in order to maintain normal rating and control as well as maximum burner efficiency. Several of the burner manufacturers sell burners that are readily convertible to oil.

Roughly, the fundamental design of burners is a method of controlling the amount of primary and secondary air

admitted at the burner, said Mr. Dare. This is accomplished in any one of the following ways, depending upon the design of the burner: (1) through the use of a series of concentric rings inside the main burner body; (2) through the use of a rotary air valve provided with two ports, one supplying primary air and the other secondary air; (3) through the use of a control gas, to permit a control of the velocity of gas stream and its burning characteristics; (4) through concentric rings for admitting air progressively to the outside boundaries of the gas stream and cracking a small amount of the air-gas mixture within the burner itself by means of a special ignition burner.

Burners available are capable of producing satisfactory luminous combustion when utilizing gases varying from a mixture of coke oven and blast furnace gas of 350 B.t.u. per cu. ft. to natural gas of 1500 B.t.u. per cu. ft. Propane or butane can also be used satisfactorily as stand-by fuel. When utilizing a gas having a low carbon content and high hydrogen content, oil can be added at the burner to increase the carbon content or luminosity.

Touching upon special burner design applications, Mr. Dare said that if high pressure gas is available (5 lb. per sq. in. to 30 lb. per sq. in.) and a customer wishes to take advantage of this fact to eliminate use of a blower or fan for supplying air for combustion a high pressure inspirating burner can be used in conjunction with the blanket or raw gas burner. The inspirator is set highly oxidizing in order to supply the required amount of air at sufficiently high temperature to crack the raw gas (from the blanket burner) and completely burn the same before leaving the furnace. The blanket burner can be a plain pipe having a small outlet at the end or a small inspirating burner having a large orifice.

In regenerative gas tanks or open-hearth furnaces, success depends almost entirely on the location of the gas inlet pipes or burner blocks and the port design, said Mr. Dare.

Where low pressure gas is used, the low pressure burner blocks are located so that the gas is introduced into the air stream at right angles, employing the use of a protection block to decrease turbulence in the gas stream. Where construction difficulties arise and there is a desire to use gas at slightly higher pressures, high pressure burner blocks can be



**EDWARD STEPHENSEN, JR.**

who presented a paper on "Recirculating Air Heating for Industrial Furnaces."

located so that the gas is introduced into the sides of the air stream at an angle of approximately 45 deg.

Mr. Dare said the cross-sectional area of the nose of the port is one of the most critical areas. This area should be determined from the volume and velocity of the gas air mixture that is to pass through it. The ratio of width to height, and the slope of the port roof are also of great importance.

Paul J. Ziegelbaur, Pontiac Varnish Co., Pontiac, Mich., reviewed the development of gas ovens for baking metal finishes of many types, and discussed factors affecting drying. A paper by O. N. Sellers, Sellers Engineering Co., Chicago, on immersion tube boilers and water heaters, led to lengthy discussion of applications. D. A. Campbell, Eclipse Fuel Engineering Co., Rockford, Ill., pointed out in his paper how high temperatures at low pressures make gas fired Dowtherm boilers an improved tool for new and difficult jobs.

Other speakers included C. F. de Mey and F. T. Rainey, Ohio Fuel Gas Co., Columbus; I. Lundgaard, Rochester Gas & Electric Corp., Rochester, N. Y., and W. H. Eisenman, American Society for Metals, Cleveland.

Five panels of discussions closed the two-day session. These were devoted to ferrous metals; non-ferrous metals; ceramics; air conditioning, and food industries.

# Current Metal Working Activity

Latest Data Assembled by THE IRON AGE from Recognized Sources

	February 1939	January 1939	February 1938	Two Months 1939	Two Months 1938
<b>Steel Ingots: (gross tons)</b>					
Monthly output <sup>a</sup>	2,954,883	3,186,834	1,703,245	6,141,717	3,435,511
Average weekly output <sup>a</sup>	738,721	719,376	425,811	728,550	407,534
Per cent of capacity <sup>a</sup>	54.10	52.69	31.74	53.36	30.37
<b>Pig Iron: (gross tons)</b>					
Monthly output <sup>b</sup>	2,060,187	2,175,423	1,298,268	4,235,610	2,727,353
<b>Raw Materials:</b>					
Coke output <sup>c</sup> (net tons)	3,148,754	3,444,256	2,598,186	6,593,010	5,477,760
Lake Ore consumed <sup>d</sup> (gross tons)	2,852,540	2,926,706	1,726,585	5,779,246	3,649,641
<b>Castings: (net tons)</b>					
Malleable, orders <sup>e</sup>		38,105	19,557		36,633
Steel, orders <sup>e</sup>		42,024	30,863		60,050
<b>Finished Steel: (net tons)</b>					
Trackwork shipments <sup>a</sup>	4,250	2,909	3,014	7,159	6,149
Fabricated shape orders <sup>f</sup>	77,036	101,559	57,144	178,595	137,464
Fabricated plate orders <sup>e</sup>		20,511	17,827		41,249
U. S. Steel Corp. shipments <sup>a</sup>	677,994	789,305	474,723	1,467,299	993,045
<b>Fabricated Products:</b>					
Automobile production <sup>a</sup>	317,200*	353,946	202,589	746,919	429,719
Steel furniture shipments <sup>a</sup>		\$1,966†	\$1,849†		\$3,846†
Steel boiler orders <sup>g</sup> (sq. ft.)		1,077‡	435,317		936,920
Locomotives ordered <sup>h</sup>	3	8	17		26
Freight cars ordered <sup>h</sup>	2,004	3	109		134
Machine tool index <sup>i</sup>	167.1	150.8	75.7	154.8†	112.3†
Foundry equipment index <sup>k</sup>	135.3	122.3	90.4	133.3	94.0†
<b>Non-Ferrous Metals: (net tons, U. S. only)</b>					
Lead shipments <sup>l</sup>		40,189	30,135		65,058
Lead stocks <sup>l</sup>		117,214	138,134		
Zinc shipments <sup>m</sup>	39,723	42,526	22,097	82,249	47,028
Zinc stocks <sup>m</sup>	128,009	128,220	108,138		
Tin deliveries <sup>n</sup> (gross tons)	4,105	4,330	4,420	8,435	9,970
Refined copper deliveries <sup>o</sup>	51,377	54,827	32,282	106,204	62,987
Refined copper stocks <sup>o</sup>	308,958	301,110	326,244		
<b>Exports: (gross tons)</b>					
Total iron and steel <sup>p</sup>		362,672	460,640		1,046,934
All rolled and finished steel <sup>p</sup>		107,552	113,589		260,874
Semi-finished steel <sup>p</sup>		15,442	30,790		71,538
Scrap <sup>p</sup>		225,434	255,627		611,408
<b>Imports: (gross tons)</b>					
Total iron and steel <sup>p</sup>		27,664	19,589		49,220
Pig iron <sup>p</sup>		586	3,354		13,101
All rolled and finished steel <sup>p</sup>		18,026	14,276		31,956
<b>British Production: (gross tons)</b>					
Pig iron <sup>q</sup>	516,000	500,500	693,300	1,016,500	1,454,400
Steel Ingots <sup>q</sup>	971,100	811,700	1,057,600	1,782,800	2,139,000

† Three months' average. ‡ 000 omitted. \* Preliminary.

Source of data: <sup>a</sup>American Iron and Steel Institute; <sup>b</sup>THE IRON AGE; <sup>c</sup>Bureau of Mines; <sup>d</sup>Lake Superior Iron Ore Association; <sup>e</sup>Bureau of the Census; <sup>f</sup>American Institute of Steel Construction; <sup>g</sup>United States Steel Corp.; <sup>h</sup>Preliminary figures from Ward's Automotive Reports—Final figures from Bureau of the Census, U. S. and Canada; <sup>i</sup>Railway Age; <sup>j</sup>National Machine Tool Builders Association; <sup>k</sup>Foundry Equipment Manufacturers Association; <sup>l</sup>American Bureau of Metal Statistics; <sup>m</sup>American Zinc Institute; <sup>n</sup>New York Commodity Exchange; <sup>o</sup>Copper Institute; <sup>p</sup>Department of Commerce; <sup>q</sup>British Iron and Steel Federation.